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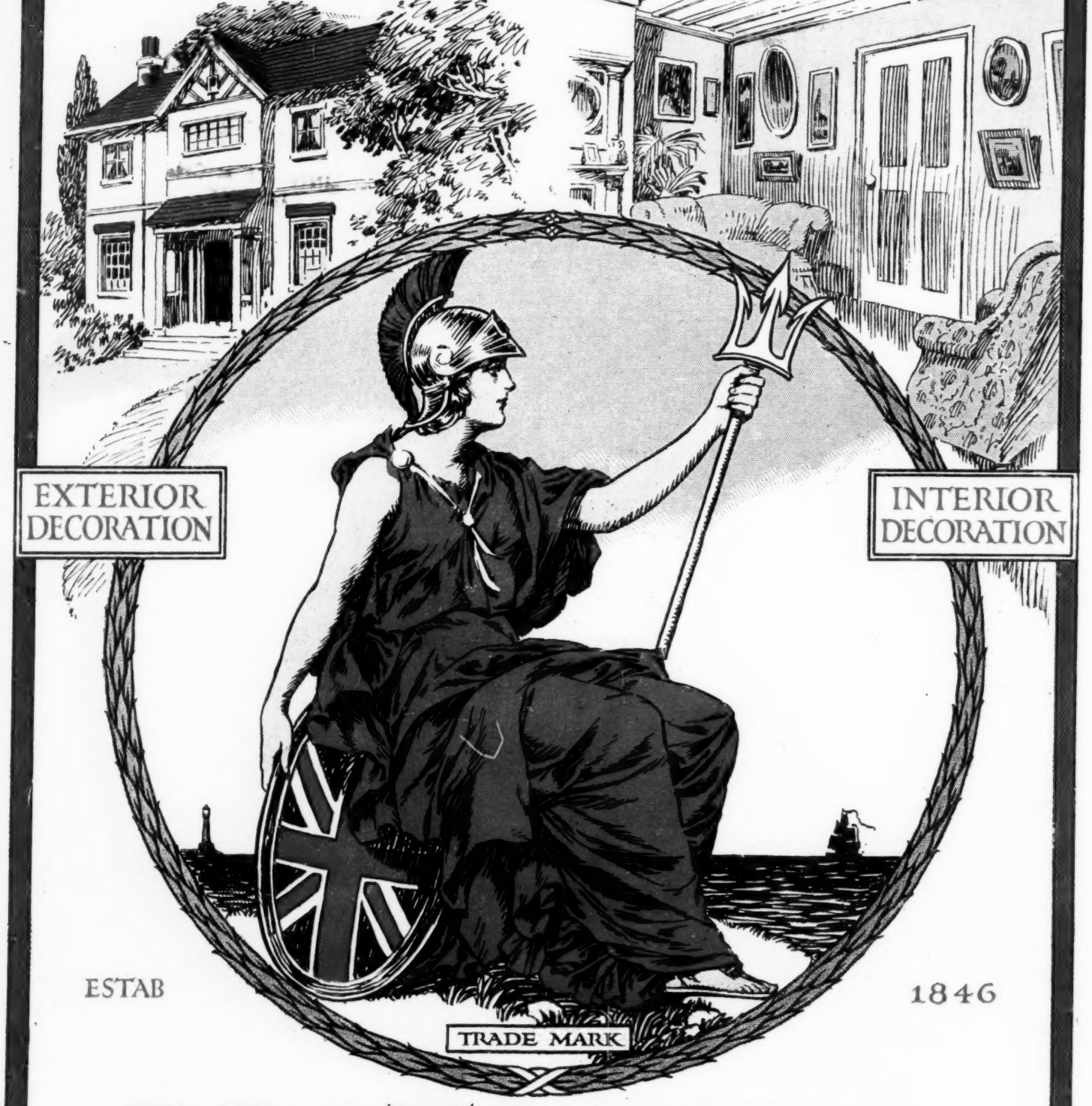

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THE BUILDER

A RECORD OF ARCHITECTURE AND CONSTRUCTION.

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THE PRESENT AND FUTURE.

THE year which is past has been in every way an abnormal one, and, looking backwards, we feel that the wonder is not that our national industries have been disturbed and dislocated, but that they have not suffered more from the effects of the tremendous conflict now being waged over the greater part of the Old World. That industry has not been more affected is due to the efficiency of our sea power and the fact that the Allied nations now facing Germany and Austria are convinced of the necessity and righteousness of the war and of the inevitable triumph which will bring it to an end, leaving to the nations of Europe a lasting peace such as its peoples have not known since the days of the Roman Empire. Whatever Europe may go through in its period of trial, it is certain that generations yet unborn will be freer, happier, and more prosperous because of a settlement only to be reached through war; while it will seem to them an epic period, marked by deeds of heroism and high endeavour. Commercially, what may be called the United States of Europe are in process of formation in the stress and unrest of war, which, while it has served to define and accentuate all that is best in nationality, also emphasises the advantage of united efforts and the existence of common interests. The present war is likely to mark the death of the old system of armed tyranny and the beginning of a new era of better understanding of the wants of humanity, and of the organisation by which these wants can be most effectively met.

Every profession and trade has contributed its quota to the armed forces of the country, and many sections of the working classes have enjoyed the greatest prosperity they have ever had—a circumstance which will have its effect on social problems in the future and must strongly affect the industry of building. High wages, an improved standard of living, coupled with the fuller knowledge which those who have served side by side in the trenches will have of one another, are bound to break down the barriers which separate class from class, and to bring in their train a recognition of the necessity for better accommodation for the dwellers on the land. The war has, in fact, accelerated housing reform by spreading the conviction that slums in country and town alike must be done away with. The greatest socialists among the working classes will have learnt, by actual example, that the upper classes are willing to face danger, hardship, and death for the nation, while they in turn will recognise that the workers of the land who have made the same sacrifices have an inalienable and natural claim to demand that the conditions of life of the workers should be made good and healthy ones. Our commercial horizon will be enlarged, and there are signs that those in authority are taking measures to cope with the new situation by dealing more sympathetically with commercial wants and interests than they have hitherto done, and a fuller volume of trade will do much towards making good the losses of war, while it will serve to give comfortable employment to a greater proportion of the population than heretofore.

Experts have predicted that we shall go through three stages after the war; firstly, a period of serious dislocation of trade, causing much unemployment and lasting for several months; secondly, a period of great trade activity, lasting for some years; and, lastly, a long period of trade depression. As to the first, it will largely depend on the rate at which demobilisation takes place, and the preparation, or want of preparation, which is now made for the coming of peace. If, as has been wisely urged in many quarters, housing and other necessary building schemes which have been kept back by the war are prepared and thought out, the building industry can absorb a great deal of labour directly it is released, while similar preparation in commercial fields will enable us to avail ourselves of the orders which will be ours if we are ready in connection with the restoration of the devastated districts in Europe. In fact, wise organisation will enable us to escape the danger of the Caudine Forks which may lie between us and the period of commercial prosperity which will inevitably follow.

It is to be hoped that our manufacturers will have learnt by experience, and will not, as they have frequently done in the past, lose markets by a failure to study the wants and habits of foreign peoples, and, if we cannot escape the recurrent periods of boom and depression which seem to mark modern industrial development, the wise co-operation between groups of industries can very largely modify their incidence, rendering it less acute. But every agency, public and private, will be needed to make up the housing deficiency and to provide the new factories and works which will be necessitated on the advent of peace, and legislation may be necessary to sweep away some of the artificial barriers which have restricted the output of capital in building enterprises.

In view of the enormous changes which are likely to take place, one factor ought to be borne in mind. In the past fifty years we have seen schools built which are now regarded as being unsuitable for modern teaching, hospitals constructed which do not commend themselves to modern science, and railway bridges built too small to permit the use of the most efficient rolling stock. The development of our towns has been so enormous and so little anticipated that both roads and buildings have been constructed which we should like to see altered and enlarged, but which we cannot afford to destroy.

We are at every turn hampered by the results of the deeds of the generations which preceded ours. Warned by past experience we may bear the future sufficiently in mind, and not allow our successors to suffer for our own want of imagination. Recently in drawing attention to the existence of slums in Scotch towns an authority regretted that the leasehold system was almost unknown in Scotland, because, while English slums disappeared automatically, the slums of Scotch towns remain, as they were solidly built. We think there is room in many districts, not for jerry-building, but for buildings meant to last for a limited period only, because future requirements may differ largely from our own, and we believe that this should be borne in mind and provided for in the building by-laws of specified areas and districts.

We have dwelt on the future largely to the exclusion of the immediate past, since, with the exception of the final stage of the Board of Trade Competition, the competition held for the Replanning of Central Bradford, and a few other projects the carrying out of which is postponed for the term of the war, building has been confined to a number of commercial premises and private works owing to the withholding of the usual grants and the shortage of labour in the building trades due to enlistment and the various munition and other works necessary to the prosecution of the war. All that can be done at present is to make every preparation for the resumption of full activities in building and its attendant industries, as it must be one of the first great callings to be needed by the community with the return to normal conditions, which we trust may not be very long delayed.

FLANDERS AND BRABANT.

PHILIP the Bold, Duke of Burgundy, acquired a wedding portion already enriched by architecture when late in the fourteenth century he annexed the province of Flanders through matrimony. When this inheritance again passed, on the marriage of Mary, the beautiful child of Charles the Bold, to Maximilian of Hapsburg, after the lapse of the fifteenth century, its architectural splendour had become considerably increased in the hey-day of mediæval art. Architecture and all the decorative arts, and a wonderful school of painting, illustrated both the splendour of the province and of the dynasty. The glories of Flanders culminated in the birth of Charles V., afterwards Emperor, at Ghent in 1500, paled in the miseries of the Spanish Terror at Antwerp in 1566, under his son, Philip II., and passed away gradually, with their designation as the Spanish and Austrian Netherlands, to enter modern times with a measure of revival in the modern Kingdom of Belgium.

The Town Halls of Flanders and Brabant belonging to the fifteenth century form a most significant group of monuments. They bear witness to the vigorous independence and wealth of their municipalities, as well as to the power of Gothic architecture in the civil sphere. Their historic witness to sturdy civic life, as well as to that of artistic and intellectual power, compares remarkably with that of the cities of the Duchies and Republics of Northern Italy at this same period of the Cinquecento; they lay respectively at the northern and southern limits of the Holy Roman Empire, with the integrity and polity of which they were both more or less concerned, but of which neither supplied a constituent. Until the primacy passed to France in the succeeding era the Flemings and the Florentines, among the European peoples, led the movements of intellectualism and art. The Renaissance illuminated both alternately and in combination; it may be said that the poles of its revolution lay in Flanders and Tuscany, and it is certain that their arts and sciences have more permanent importance than the furtive political *jeu de paume* between the Emperor and the Pope which fills the historian's perspective.

The Netherlands are but reminiscent of the discomforts of Erasmus at Louvain, though the influence of his intellect diffused itself throughout Europe; they still, however, retain amidst their original associations some of the works of the primitive and Early Flemish painters, though most are gathered into galleries at Brussels and Antwerp, and a representative sprinkling gives interest to many foreign collections; but the architectural art of the Flemings is necessarily rooted in the soil. It is in Flanders and Brabant only that pilgrimage can be paid, and, so long as the exigencies of modern civilisation permit, the architect will derive from these provinces the still vital inspiration of the civic splendour in their unrivalled group of mediæval monuments. Bruges, Ghent, Brussels, Louvain, Ypres, and Courtrai furnish a list of Town Halls and Courts of Justice as consistent in their epoch of the fifteenth century as they are varied in character. The Hôtels de Ville of Louvain and Ghent resemble one another in type, but the variety of all in the group is very marked—the scale is always magnificent, dominating the city as the cathedral does in England; the mass is powerful and concentrated in outline, the detail rich within and without; and the towers and belfries piquant and original in form. This wealth of spontaneous freshness, which does not sink into the exaggerated originality of the Renaissance, and the characteristic municipal type, which is never suggestive of the ecclesiastical tradition, as in the secular Gothic of our own land, have afforded especial profit to the English architectural student, who has discerned in these buildings, not only a new virility in Gothic design, but a correspondence to the claims which our modern development of municipal life have imposed upon him.

English civic architecture of the nineteenth century seemed to lie outside the natural bed of the stream of the Gothic Revival. Ecclesiastical life and art, in the accepted nature of things, appeared to transcend that of the commercial market-place and the ideals divided in architectural expression. Arguments with which the vituperative Pugin assailed the habitual Classic architecture did not attach to buildings of secular purpose with any sticking quality; he was more effective in attacking the use of "Pagan" forms for places of Christian worship than in abusing the grandeur of Hardwick's entrance to Euston Station. It is not to be wondered at that the clergy responded more readily than the laity to the Gothic movement, and a dual architectural ideal was for a time accepted. Sir William Tite, the architect of the Royal Exchange, was as content in his day to adopt a Gothic style for the Scotch Church in Regent-square as the Liverpool Cathedral Committee in ours, with belated zeal, has been to stipulate for a Gothic glorification of the city of St. George's Hall. The wealth and increase of ecclesiastical art at home, compared with secular remains, afforded a natural fount for students, and was more easy of translation into practical purposes of a similar nature than of use for civil purposes. Domestic architecture, which in England hankers after Romanticism, employed Gothic from the earliest dawn of the Revival and enjoyed an imagined association with Norman and Plantagenet ancestors in the use of their ornaments and battlements. It was the competition for the Houses of Parliament, the most important edifice in England of the nineteenth century, which first induced the application of serious Gothic to a great secular purpose. The success of the group is really accidental through the reaction of the enforced dignity of the plan upon the mixed elements of the elevation and by aid of the robe of tracery and petty detail which uniformly enriches each of the very diverse elevations. But the source of interest was in its relation to Henry VII.'s Chapel near by, and the building, with all its assumed slavery to historic guise, is without any real English precedent. This is not perhaps to us a matter of regretful comment; it is rather a welcome, because undesigned—evidence of the essential strength of the character of our age in asserting itself through such an elaborate mask. By the time that the New Palace at Westminster was completed Tudor Gothic was thoroughly played out as material for Revival. The patriotic glamour of its peculiarly English phase of Gothic did not avail long; no public building, even of minor importance, was attempted by any leader of the school, and it was left to Sir James Pennethorne, an accomplished Classicist like Barry, to sing the swan-song of modern Perpendicular in building the Record Office on a retired site in Fetter-lane. The subsequent extensions to the important frontage in Chancery-lane by the official architects of the Office of Works, of course, do nothing to redeem the failure of this final experiment in Tudor.

But the devouring energy of the Gothic movement was not to be contented with a monopoly of ecclesiastical or a predominating influence in domestic architecture. The competitions at Manchester—first for the Assize Courts and soon afterwards for the Town Hall—revealed a widening outlook, and a survey of the series of municipal buildings belonging to the era of the Law Courts competition proves not only the defeat of the Italian School of Sir William Tite, but the advent of Continental elements into the civil architecture of the Gothic Revival. If France at this period was contributing new life to our ecclesiastical work, Flanders was inspiring the architects of our civil buildings by its suitably magnificent types. There was a competitive stress between the appeal of such examples of what was proudly known as the universal Classic style, as the Town Halls at Halifax and Leeds and the new expression of Gothic in the municipal buildings at Manchester, Chester, and Northampton. With freedom and adaptability came originality. The opportunity was taken advantage of for secular Gothic towers and Campaniles of a non-ecclesiastical type, for which the Clock Tower at Westminster was not a sufficient inspiration, and we can appreciate the eagerness with which the belfries of Flanders were seized upon, digested, and re-embodied as entirely direct expressions of civic power.

To this epoch belongs the design by Sir Gilbert Scott for the Town Hall at Hamburg, which is reminiscent in its composition of the Great Cloth Hall at Ypres. The design undoubtedly had great influence and probably attracted attention to its prototype. Ypres illustrates mediæval secular architecture on a scale which is unrivalled on the Continent, and embodies elements of dignity more usually attributed to Classic. It has a grand tower, centrally placed, rising from the plane of an immense length of elevation, rendered effective by the symmetrical repetition of traceried windows in the middle story and by a continuous parapet cornice. Gothic without buttresses and with a severe economy of pinnacles was a new

and welcome phase which quickly caught the public mind and introduced a much wanted motive of rhythmical breadth into the practice of Gothic. Massive grandeur as at Bruges, richness concentrated as at Ghent and Louvain, and emphasised with a symmetrically-placed tower as at Brussels, all illustrate the wealth of the architectural lessons of the Low Countries to English architects competing for the erection of Hôtels de Ville for the flourishing commercial centres of England.

The tale of examples could be extended with a corresponding list of resultant designs. The requirement at home, the precedent abroad, and the enthusiastic designer were coincident, and we thus possess at home abundant concrete illustration of a real and modern architectural indebtedness to our Belgian ally.

The charms of Flanders have not exhausted themselves with the fading of the activity of the Gothic Revival. It is now strangely impossible to imagine a Gothic design winning an important municipal competition; the whirligig of time is so rapid that, while a generation ago nothing but a mediæval County Council Hall could have been a proper pendant for the Houses of Parliament, to us the idea is weirdly belated. But near by is New Scotland-yard—if not Flemish, yet of the Low Countries in its suggestion and waterside charm. The brickwork revival, with which its lamented architect was associated and which happily has not wholly spent itself, is founded both indirectly through its ancient English prototypes and directly through the sketch-books of tourist architects upon the simple fronts which abound in the streets of Flanders. Bruges, Malines, and Ghent are all near at hand, and a short holiday is sufficient to replenish a sketch-book and provide a stock of easily-applied and charming treatments for economical school blocks and of the quaintnesses for which the public have been trained to ask. The lofty churches and famous steeples, such as Antwerp and Malines, have character of their own which perhaps have not directly fed the pencil of the designer, but which are most dear to the artist. Their contents, as a rule, exceed in interest that of the buildings. There is wonderful mediæval woodwork at St. Sauveur, Bruges, and St. Martin, Ypres; Renaissance marble screens, metalwork, and enamelling, as in the tombs of Charles and Mary at Notre-Dame, Bruges—a church which also contains the marble Madonna of Michelangelo. The pulpits are world-famous, and rival one another in realistic fantasy, and, besides, are masterpieces both of technical achievement in sculpture and construction in wood and marble. The sober interests of an archæological parade around the choir of an English cathedral have no comparison with the artistic excitements of the tour round churches like St. Bavon, Ghent, or St. Sauveur, Bruges. The wealth of mediæval painting at the former is represented by Van Eyck's Paradise Triptych, and the masterly Renaissance screens and organ at the latter are memorable and typical of the wealth of the Spanish era. The glories of the later school of Rubens and the grandeur of scale of the Renaissance churches of the seventeenth and eighteenth centuries belong, of course, to Antwerp, Malines, and Ghent, and probably rise to every artist's mind instinctively as first in especial recollection.

The potent influence which the municipal buildings of Flanders have exercised over our own architecture in recent years was ephemeral, but the many charms of Flemish art remain powerful, varied, and constant. The surge of war is now over the provinces, destroying and sparing in its unreasoning fits of fury, making dreadful history upon its buildings under our eyes. These monuments have been the artistic inheritance of European civilisation as a whole, but as a whole it has manifestly lacked the power to prevent their danger or destruction. The success of the Allied Armies, the speedy reoccupation of Flanders and Brabant, and their restoration to their rightful ownership afford the only hope for the preservation of what remains to us of their marvellous buildings and works of art, and its early achievement is the prayer of all lovers of the unique inheritance of these provinces.

NOTES.

A Fortunate Discovery.

SOME two years ago the Society of Dilettanti presented to various institutions spare copies of steel plates from the folio volumes in which they had from 1769 to 1840 published the results of the Ionian expeditions sent out by the Society; but, having disposed of their stores, they came upon a parcel which contained original drawings of architectural subjects, together with proof engravings from nearly sixty plates. As these were supposed to be plates from published volumes, the Society offered them to the Royal Institute of British Architects, and the plates and engravings were exhibited in the rooms of the Institute in 1913. While they were on exhibition Professor Lethaby discovered that the plates, though engraved as long ago as 1830, had never been published, and the discovery was communicated to the Society of Dilettanti, a search through whose archives revealed the fact that these drawings, made by the members of the Second Ionian Mission in 1811, were to have been published as a companion volume to Part III. of the "Antiquities of Ionia," which was issued in 1840. The project was apparently delayed by the death of William Wilkins, R.A., who acted as architectural expert to the Society, and was also editor of the work. The plates have been fortunately rediscovered, and are to be issued in book form, Professor Lethaby being the editor. The new volume will be known as Part V., being a supplement to Part III., and will deal with the great temple of Artemis at Magnesia, and with monuments at Myra and other Lycian cities. It will probably be published in February.

The Arrangement of the Victoria and Albert Museum.

A LETTER to the *Times* calls attention to the fact that the necessity for moving original and costly specimens of metalwork to secure parts of the museum has made the collections which remain more attractive and of greater educational value, the collections on view not being overweighed with duplicates, triplicates, and trifling originals. The writer says that the range of historical illustration of goldsmiths' and silversmiths' art is wider than hitherto and more in evidence, including Greek work dating from 1500 to 1000 B.C. to mediæval and Renaissance examples. All the objects are reproductions, facsimiles of originals belonging to other countries, which could be replaced if destroyed. The writer very reasonably suggests that, as the object of the South Kensington Museum is an educational one, good copies are of infinitely more value than poorer originals, and that a similar process of revision and rearrangement might profitably be carried out by the authorities during the war. The suggestion is an admirable one, and will, we hope, be considered by the authorities. We might add that the model of Wren's first design for St. Paul's, of which we give photographs in this issue, should be repaired and placed in a suitable position in South Kensington, since it probably has more interest to Englishmen than any architectural exhibit in the Museum, while it can only be examined with difficulty in its present obscure position.

Inspectors of Munitions.

WE notice that questions have been asked in Parliament as to the qualification of those engaged by the Government to act as inspectors of munitions, and that considerable astonishment and some dissatisfaction were expressed at the result of the inquiry. It is not to be wondered at perhaps that the Government were unable to agree to lay down any hard-and-fast line on this question. There is a sense in which it may be said that the greater part of our national efforts are being carried on by amateurs or by men hastily trained for this special work. It is obvious that the Government must have a free hand to avail themselves of the services of teachable men, whatever their antecedents may have been. But we think we are right in saying that in such matters as the inspection of munitions, and the finer and more accurate work connected with their production, it has been found that men of superior education and quickness and delicacy of perception are better in many important respects than those who have spent their lives in the usual routine of mechanical production. If the Government require the services of such men they cannot do better than engage those architects whose work they have stopped by direct administrative action. Architects are accustomed to work to scale and have an appreciation of accuracy, and should, we think, be found more suitable for this work than most other men of equal education.

Stonehenge.

THE local Secretary for Wilts of the Society of Antiquities writes to the *Times* on the subject of Stonehenge. Any other Government, he says, but an English one would have seized the late opportunity of acquiring it. The writer is probably right as to this, since smaller Druidical monuments in Brittany have the inscription "Property of the State" affixed to them, but we question whether Stonehenge would be safer if it were so protected. Under the present law we believe the stones cannot be removed or used as in past ages for building material, and it hardly seems if this is so that they are exposed to any other dangers than those of time and the effects of weather. There are no mouldings or carvings to be damaged, and the worst that can happen is that a few may scratch their initials on one of the monoliths. We are naturally glad that it is not within the power of anyone to use them as building material as they were used in former centuries, but we think it may in this case be possible to carry antiquarian zeal and enthusiasm somewhat too far.

E

LEON BATTISTA ALBERTI AT RIMINI.

THE little town of Rimini* on the Adriatic, one of the five towns of the ancient "Pentapolis Maritama," is open, brisk, and healthful to the traveller, offering a pleasant contrast at some seasons to the more marshy climate of Ravenna, and recalling the liveliness of Treviso or Pavia. Like its sister towns of Fano, Pesaro, Sinigallia, and Ancona, it is of Roman foundation, and, while its massive arch of Augustus is of capital importance as a relic, it also possesses the rare privilege of a well-preserved Roman bridge, spanning the River Marecchia on the north side of the town. Bridge and arch are in association, but at opposite ends of the Via Augusto, so that we have, in effect, a veritable Roman way.

In its Cathedral of San Francesco, however, Rimini possesses another monument of much greater significance in the history of Art. It is in the centre of the town, and can be approached direct, but the force of contrast is greater if one turns aside to it from the principal street and spies it suddenly at an angle, looking for all the world like a third Roman fragment, but grander and more impressive than either of the others. Here we are in the heart of the Rimini of the early and middle *Quattrocento*, which belonged body and soul to the fiercely vivid family of the Malatesta. Their house, the Castel' Malatesta, is to be found on the walls at the west of the town, but modern military necessities have obscured its original purpose; it is San Francesco, cathedral and monument in one, that is stamped all over with the personality of the greatest of their race—that Sigismondo Pandolfo Malatesta who patronised art and learning, but turned aside at times in a white heat of passion to make the streets of the town run with blood.

If there is perhaps no association of town and despot more vivid to us than that of Rimini and the Malatesta, immortalised in Dante's vision, there is certainly no happier relic of those fierce times of emperor, pope, and *condottiere* than the barn-like thirteenth-century church, transformed by the genius of Leon Battista Alberti into a notable monument of the Renaissance. Alberti was an outstanding giant in the early time of the new classical outlook, and this church is one of his greatest works. On account of it, and of three other later works—the façade of Sta Maria Novella at Florence, the Palazzo Rucellai at Florence, and the church of Sant' Andrea at Mantua—the scholar of noble family and author of a learned treatise on architecture who was responsible for them is alive to us as an architect combining those rarest of qualifications—large grasp and extreme refinement. Further, if we had to choose one work of them all by which to compare him with his fellows, it would probably be the church at Rimini.

Alberti takes his place in the history of the Italian Renaissance as the third great pioneer in architecture. Born in 1405, twenty-six years after the advent of Brunelleschi, he lived till 1472, or three years before the birth of Michelangelo, and his career thus spanned a most important part of the fifteenth century. He was at his prime in the very middle of that epoch, beginning his work at San Francesco apparently about 1446—the year of Brunelleschi's death and a few years before the birth of the elder Antonio and Giuliano da San Gallo. Bramante was born in 1444, so that, broadly speaking, we see two great periods defining themselves—the first represented by Brunelleschi, Michelozzi, and Alberti; the second by Bramante, the San Gallo, and Cronaca. Yet a third and culminating period is identified with architects to whom the foregoing were leaders, conspicuous among whom were Peruzzi, Sanmichele, Sansovino, Michelangelo, Raphael, and Giulio Romano. With regard to Alberti, in the twenty odd years that elapsed between the rebuilding of San Francesco and the erection of Sant' Andrea at Mantua, the delicate pilaster style which he himself inaugurated at the Palazzo Rucellai had its day and disappeared, its principal exponent being Bernardo Rossellino, whose career ran curiously parallel with that of Alberti, and who may have begun by working under him at Florence. That Rossellino was a man of ability we can see from his authentic buildings at Pienza, though the extent of his influence outside that town is rather a vexed question. With this possible exception, Alberti appears to have founded no direct school,* just as he owed very little to the work of his immediate predecessors.

His most mature work—Sant' Andrea at Mantua, which was uncompleted at his death—may well have exercised a profound influence on later church buildings. The whole conception of the plan and structural form of this great church, which was more than 110 yds. long inside, stamp it as the work of a man who was master of his art, who was accustomed to think in a large way, and who was a constructor as well as a theorist. The broad pier treatment of the Mantuan church, with its recessed chapels and coffered barrel vault over the nave, got right away from the columnar basilican plans produced by Brunelleschi at San Spirito and San Lorenzo at Florence; while its great porch, well over 100 ft. wide, anticipated the mature work of Bramante as well as the soaring creations of Michelangelo. Alberti's line of development was not so much that of the early Christian basilican churches as the more important Roman buildings with their vaulted ceilings carried on massive structure.

Such an output of work as Alberti's, though limited, is sufficient to stamp a man as pre-eminent. Architects can claim him for their confraternity as one of the foremost even in an age of splendid building. Is it more amazing, or less, that we find the man behind this work almost comparable to Leonardo in versatility, of magnificent physical gifts, a profound student of law, music, and mathematics, taking to architecture, in fact, only when his health broke down? We are not really concerned with the answer, since his building work was of such enduring quality. For that we are content to take him as he stands, yet he must be given a prominent place in any survey of the Italian Renaissance in the widest meaning of that great time. In the finest medallion portrait* we have of him, with its nobly-proportioned head, its eager sensitive face, we seem to see one of the most princely personages of any age.

It has been said already that San Francesco at Rimini is a monument as well as a church. This is so in fact, as, besides being constructed in honour of Almighty God, it is a veritable casket containing not only the structural relics of the earlier church, but of all that Sigismondo Malatesta could possibly do to assure future ages of his existence. The exterior, which is of marble, is uncompleted at the east end, but Alberti evidently intended to make an entire building of it. The façade exists, as well as the side walls, 6 ft. thick, which cover the Gothic walls, and are pierced with round-arched openings to suit the earlier windows, the lines of the main entablature and base being continuous, so that the remodelling is no mere elaborate frontispiece and plain building behind, but a homogeneous creation. These openings,

* At the time of writing dangerously liable to Austrian attacks by sea or air.

* His connection with Rossellino is a matter of interest. Perhaps Alberti may have designed some buildings which Rossellino carried out. A passage in Vasari seems to suggest as much, though Vasari appears to belittle unduly Alberti's constructive ability.

* There is a cast of this in the British Museum, the original being in the Dreyfus Collection. Mr. G. F. Hill, following Heiss, considers it was probably executed by Alberti himself. (See Hill's "Pisanello"—Duckworth.) The writer's acknowledgments are due to Mr. Hill and to Messrs. Duckworth for the reproduction.

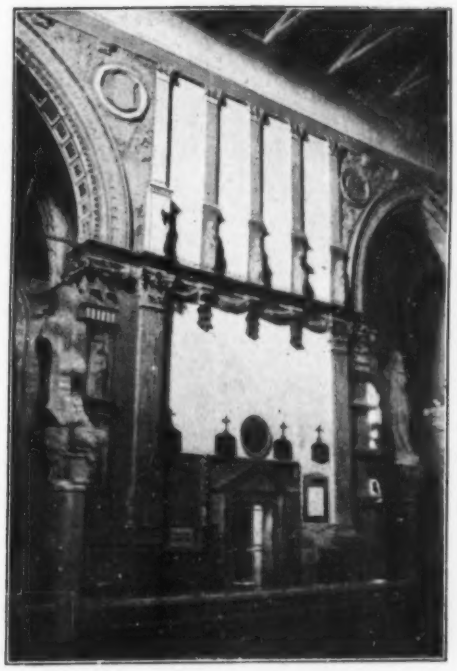
Leon Battista Alberti.

From a cast in the British Museum of the original medal in the Dreyfus Collection.

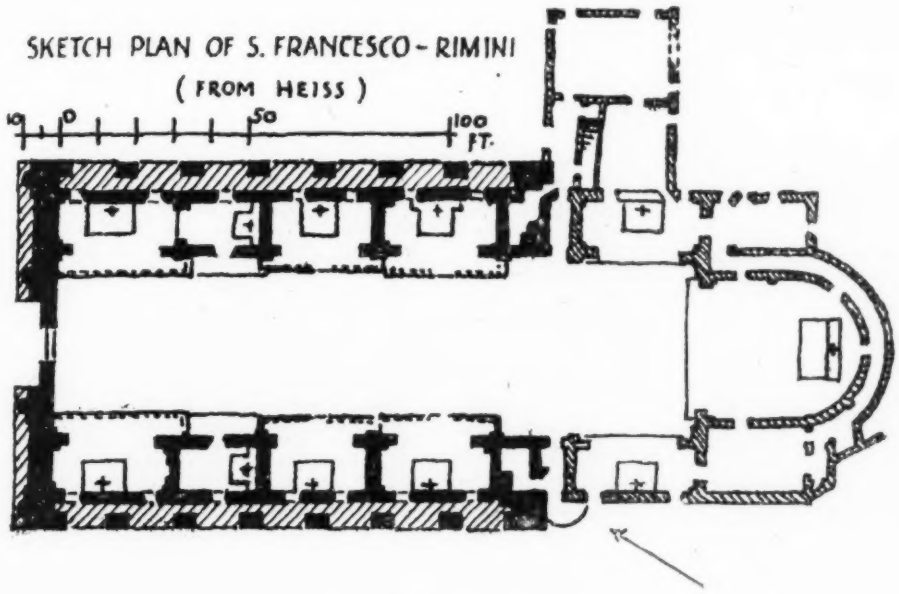
(By kind permission of Messrs. Duckworth & Co.)

[*V. Farneti, Rimini.*

S Francesco, Rimini: Interior, looking East.



S. Francesco, Rimini: Interior, North Side showing door to enclosed chapel.



Cast of Medal by Matteo de' Pasti (c. 1450), showing front of S. Francesco, Rimini.

S. Francesco, Rimini: Façade.

Arch of Augustus, Rimini.

on the south side, contain sarcophagi—a device, whether of patron or designer, which embodies a fine idea and emphasises by a master-stroke the whole meaning of the restored edifice. What, indeed, could be more complete in every sense than this recurring potency of monument thus associated with the structure of the whole? One of the sarcophagi contains the bones of an ancient scholar of renown, brought back reverently from foreign lands by Sigismondo.*

The façade conforms to the prevailing type employed, both in earlier and later work in Italy, the ultimate Renaissance version being fully foreshadowed by Alberti at Sta Maria Novella.† Here simple straight slopes at the aisle roofs take the place of the scroll-like endings of the Florentine church. The upper structure of the front is incomplete, but the intention of the designer becomes clear if we study the commemorative medal of Matteo de' Pasti, struck in 1450.‡ Pasti, besides being an accomplished medallist, seems to have been a useful man in other respects. We gather that he and some others acted as assistants or clerks of the works to Alberti, and may have materially assisted him with the execution of the design.§ The medal was made with such nicety and attention to detail, and is so accurate in its representation of the lower part of the building, that we can safely accept its accuracy for the whole without question. We learn, therefore, that the roofs of the aisles were to be finished with bow-curves, and that the existing recessed imposts of the crowning central feature carried a semicircular arch, and above that a pediment. We should have inferred this finish from the analogies of both Sta Maria Novella and Sant' Andrea. The dome which overtops the pediment in the medal was evidently intended by Alberti over the crossing.

In its general impression the façade as it exists to-day is so big, so simple, and so grand that one hardly realises it is just that of an ordinary Italian church of rather more than average size, with 6 ft. or so tacked on at each side for the thickness of the new walls. In his fine use of the applied columns Alberti may have been working on the idea of the Roman archway in the town,‖ and one can see a reminder of its circular-framed spandrel busts in the stalwart wreaths of the spandrels of the church façade, which are repeated on the sides at about the same level. At any rate, the front is certainly Roman in spirit, with a new importation of thoughtful, caressing, lavish detail. One feels that in England no one could have done such a front but Inigo Jones, perhaps no one in Italy but Alberti. There is, indeed, a similarity in the work of the two men. The wealth of beautiful design in the carving of the podium at San Francesco reminds one of the balustrade reliefs at Pergamos, but the masculine detail of the column caps, the vigour of the mouldings, and the fine treatment of the great doors are characteristic of the English master.

The exterior of San Francesco would alone render it one of the most interesting pieces of work in Italy, but there is also, fortunately, a remodelled interior for which Alberti must be held responsible. Here the problem was difficult, as without entire reconstruction the Gothic character of the original structure was bound to be more insistent. It was allowed to remain of necessity, but was so lavishly classicised that on entering it is at once apparent that one is inside a Renaissance temple and not a mediæval church. The hand of a master is evident, however. By means of a rich and practically continuous line of high railing to the chapels, and a frieze-band above the pointed arches—both associated at the east end with the round-arched opening to the sanctuary—base and horizontality are given to the delicate Renaissance trappings on pier and wall, which are added with infinite skill. Large romanised capitals are inserted at the imposts, but they are tempered by the finely broken-up panelled piers and a wreathed decoration in the spandrels which makes them throb with life. The pilasters on the main piers forming the lower order are completely elegant and full of proportion to their surroundings. The upper pilaster treatment is worthy of Brunelleschi at his best, and one need say no more. There is not only an unswerving sense of scale and a mastery of graceful detail in all this, but the evidence throughout of a large and daring mind.

Noticeable features are the detail of the altar railings, crowded with marble colonnettes—the braggadocio of the donor, whose name is carved large on every arch with the inscription that he, "Sigismondo Malatesta, did this"; while the little side doors with low relief marble medallions and panels are as fine *Quattrocento* work as any existing. The greater part of the carving and sculpture work throughout is of the very finest quality, colour being freely introduced after the manner of the Della Robbia. To quote Symonds:—"Allegorical figures designed with the purity of outline we admire in Botticelli, draperies that Burne-Jones might copy, troops of singing boys in the manner of Donatello, great angels traced upon the stone so delicately that they seem to be rather drawn than sculptured, statuettes in inches, personifications of all arts and sciences alternating with half-bestial shapes of satyrs and sea-children—such are the forms that fill the spaces of the chapel walls, and climb the pilasters, and fret the arches in such abundance that had the whole church been finished as it was designed it would have presented one splendid, though bizarre, effect of incrustation." The work certainly deserves the most careful study for itself, apart from fuller investigation as to authorship. It is said that Ciuffagni and Agostino Antonio di Duccio, of Florence, took an active part in it.*

The theory that Alberti himself had no part in the decoration of the interior† is a narrow one, and from external evidence alone appears to be quite contrary to fact. Apart from the architectonic grip of the interior, it is clear, from what we know about the man, that he would take ascendancy over others in any design with which he was associated. Between 1446 and 1461 he must have been often, though not constantly, in Rimini, and his fertile brain would have conceived not only such essential design as exists, but the entire remodelled structure. It is, of course, possible that he ultimately intended to cloak completely the Gothic structure of the interior, even to the extent of rounding the pointed arches; and by running a barrel vault through the whole length of the structure, pierced by transepts and a dome at the crossing, make an entire Renaissance church of it. We are certainly told that he made a model, whether or not this showed the construction of the interior.

The church, however, was never completed. Sigismondo Malatesta, who died in 1468, appears to have got into difficulties about it in 1461,‡ and for some years previous to that date the work evidently proceeded slowly. We are therefore left with a fragment, stamped outside with classic fervour and inside with the spirit of the *Quattrocento*. In the field of mediæval classicism Alberti obtained a different result in the great west front of Sta Maria Novella, but he was Roman in his outlook, though the work in the interior of San Francesco may have influenced the strange and beautiful ecclecticism practised after his day in Lombardy—seen to perfection in the lower part of the Certosa at Pavia, and in Sta Maria della Grazie at Milan. He certainly had his reward in achieving, in Sant' Andrea, Mantua, a greater conception of interior than the Lombard churches ever arrived at. In the Palazzo Rucellai he was working to more rigid conditions, which had been laid down, partly, by his predecessors. The "Tempio della Malatesta" is less bound by stereotyped lines, and if it does not constitute such a great creative whole as Sant' Andrea, enough may have been said to show that it should be a pilgrimage church to the student.

Our portfolios are overhauling the monuments of the past, but so far it has not been the fortune of the writer to have seen any studies of this church. It can only be hoped that if it escapes the havoc of war we shall see, in time, a fine illustrated monograph of it by a British student. THEODORE FYFE.

[**** Some of the photographs which we give in connection with this article were taken by Mr. Fyfe.—ED.]

* J. A. Symonds, "Italian Sketches," etc

† W. J. Anderson, "The Architecture of the Renaissance in Italy."

‡ The author is indebted to Mr. G. F. Hill for use of the cast of this medal.

§ Thieme and Becker's "Lexikon."

‖ W. J. Anderson.

* Thieme and Becker. Symonds thinks that some pupils of Donatello and Benedetto da Majano worked at it. He must be wrong about the latter, as he was not born till 1442.

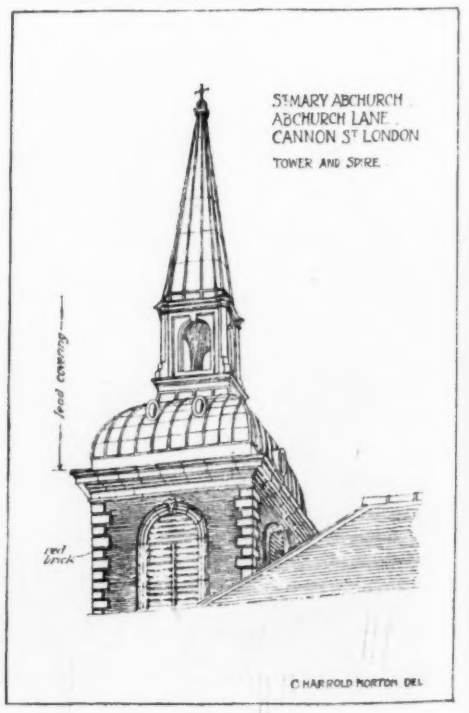
† Thieme and Becker.

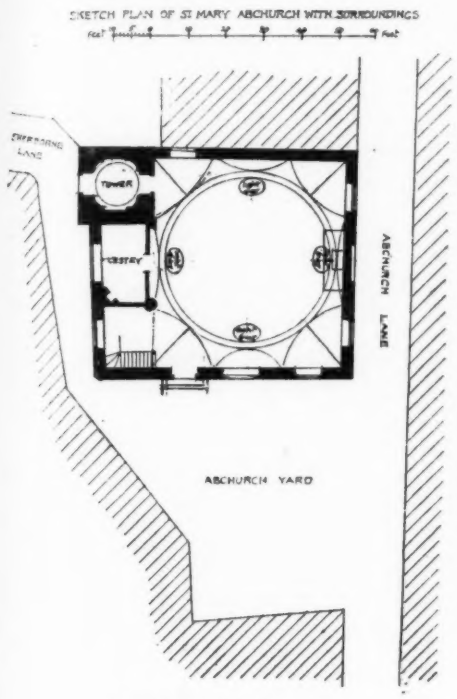
‡ A. Heiss, "Les Medailleurs de la Renaissance."

THE LONDON CHURCHES OF WREN AND LATER ARCHITECTS OF THE RENAISSANCE.

IT was fortunate that the Great Fire of London did not occur at an earlier date, for, instead of the world-famed group of Renaissance churches built by a great genius, we might have had a number of tentative hybrid efforts like the church of St. Katherine Cree, which, though interesting historically and archæologically, would have been in no sense so great a contribution to our architectural history, and probably would not have been marked by the sense of proportion and dignity which distinguishes the "Gothic" churches of St. Michael, Cornhill, St. Mary, Aldermanbury, and the spire and tower of St. Dunstan-in-the-East, poor as those works are beside the Renaissance churches of Wren. Great epochs in architectural history are frequently short-lived, and, although the scholarship of the Renaissance was better understood in later ages than in the time of Wren, we feel as we examine the work of even those men who came under the immediate influence of the master that the incomparable mastery of form and mass possessed by him was feebly echoed in the work of Gibb, Vanbrugh, Archer, and the lesser men who followed. Wren possessed a magnificent sanity of mental outlook, of which we find little evidence in such churches as St George's-in-the-East, St. Anne, Limehouse, or St. Paul, Deptford; while St. Martin-in-the-Fields, St. Giles-in-the-Fields, and St. Mary-le-Strand form an intermediate group finer than what was to follow, but less poetic and resourceful than the work which had preceded them.

Wren, like other of the great men of architectural history, was not uniformly successful, and, while he gave us the steeples of St. Mary-le-Bow and St. Bride, combined them with dull and tame interiors; yet there is hardly a church which he built which either from the beauty of its interior design or external treatment





St. Mary Abchurch.

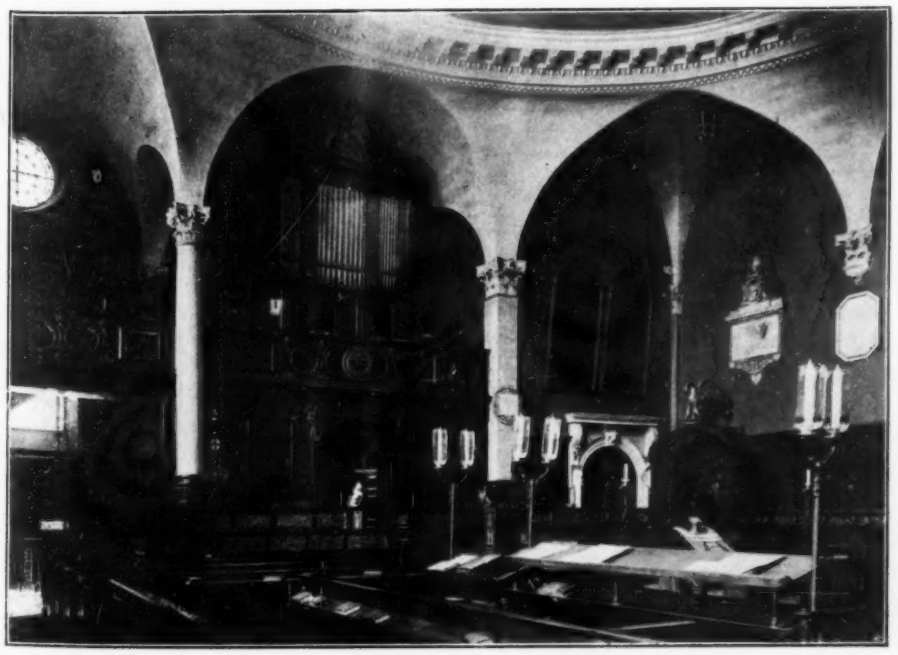
St. Mary Abchurch: View looking East.

does not charm the lover of architecture and appeal to the instinct of beauty which most of us possess. No great architect in this or any other country so fully considered economy of materials and construction; we feel he might have been constrained by an economical employer, whereas his work is the outcome of a nature at once gifted and modest, one who seems to have felt it his duty to obtain the best possible result in the simplest and most economical manner, in striking contrast to many of his foreign contemporaries, who freely divorced themselves from practical requirements in their indulgence of their æsthetic conceptions. Occasional lapses from a standard of good taste are what only can be expected from one who acquired his architectural knowledge late in life, and who gave us the astonishing variety displayed in Wren's erections. Hidden away among masses of houses, in cramped positions and restricted sites among narrow lanes, the greatest of English architects always contrived what has given to a city more immense than he ever dreamed of its abiding charm and interest. So the churches of London form museums where we can study the story of the English Renaissance, sanctified by the memorials of the dead who in their generation have helped to build up the nation of to-day, and it is to be hoped that their stones will remain monuments too precious to be sacrificed for improvements or for commercial gain. We shall, in the following months, give a short description of each church, illustrated by sketch plans, showing the surroundings, sketches of the towers and steeples, and, as far as possible, by photographs of the interiors or in some cases of portions of external or internal detail.

No. I.—St. Mary Abchurch.

The church of St. Mary Abchurch is situated in Abchurch-lane, near to its southern end in Cannon-street, and closely surrounded by adjoining buildings except on the side which faces Abchurch-yard, which was originally the burying-ground of the church, its boundaries being still marked by posts.

The advowson of the rectory of the former church belonged in ancient times to St. Mary Overy, Southwark, but at a later date was bestowed by Queen Elizabeth on the Master and Fellows of Corpus Christi College, Cambridge, in whose gift the living has since remained. After the Fire the neighbouring church of St. Lawrence Poultney was not rebuilt, and its parish was united with that of St. Mary Abchurch.

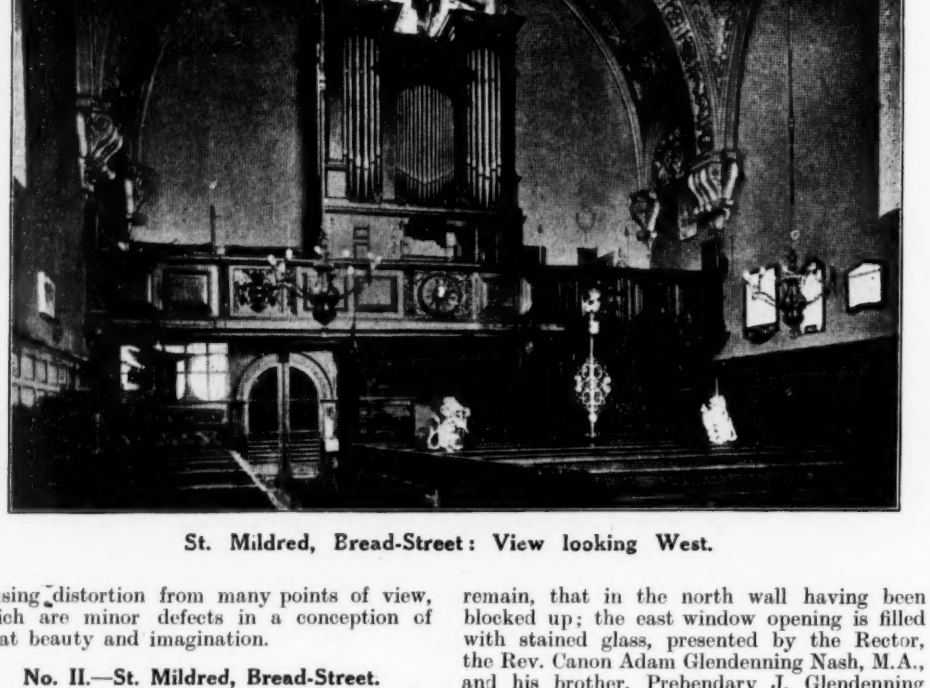


St. Mary Abchurch: View looking West.

The present church was rebuilt by Wren in 1686, and is among the smaller City churches, covering a space of a little over 60 ft. in each direction. The external treatment is simple, no attempt being made to obtain architectural effect or even symmetry, everything but the tower which closes the narrow vista of Sherborne-lane being absolutely utilitarian in character. The tower, with its curious ogee roof surmounted by a spire, is not among Wren's happiest efforts; but, on the other hand, the interior is one of the richest and most beautiful of London churches. The organ gallery, altar-piece, pulpit, pews, and door-cases are unusually rich and beautiful examples of design, and there is much admirable carved work by Grinling Gibbons. The font, which stands beneath the gallery, is surmounted by a carved oak cover with figures of the four evangelists; the pews in the westernmost of the centre block display the City arms, and the Corporation pews against the west end have elaborate sword rests. The high pews along the north and south walls are an unusual and picturesque feature. Among many monuments is one to Sir Patience Ward, a noted politician and Member for the City of London in the Convention Parliament of 1688-89, while another elaborate monument is that of Edward Sherwood.

The dome was painted by Sir John Thornhill, and its dark colour, combined with the deep red walls and painted glass, somewhat detract from the effect of an interior which would bear ampler lighting and a more subdued scheme of decoration. The treatment of the interior, with its dome resting on plaster pendentives, is extremely happy; the whole giving an idea of spaciousness and warm richness which render it one of the most successful of Wren's interior designs.

The manner in which the internal setting out is effected is very characteristic of the period, forming a middle stage between the irregularity of mediæval days and the exact accuracy of a later date. Wren, as in most of his smaller churches, showed his disregard of right angles. None of the outer walls, which probably mark former boundaries, are at right angles to one another. Nor is the central space reduced to a square, and, in addition, the dome is not centrally spaced between the north and south walls, so that the pendentives have unequal projections. The angle of the tower is marked by a pilaster, the corresponding support being formed, as at St. Swithin, by a single free-standing column, the windows cut into the bays between the pendentives without regard for exact centre lines. But the most unfortunate feature is the treatment of the pendentives next each angle, which form an awkward mitre where they intersect



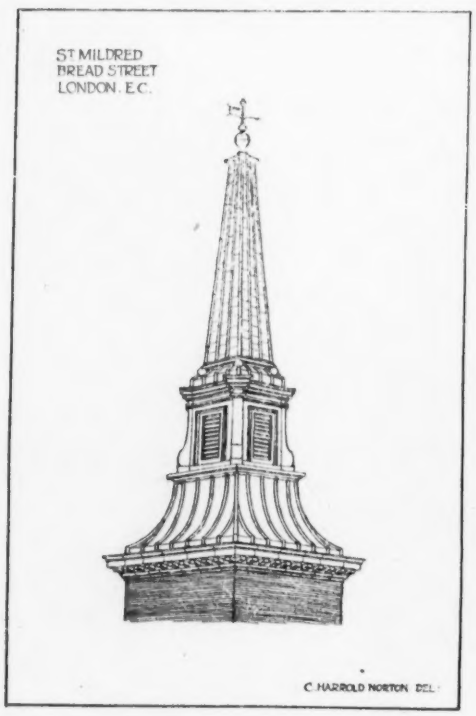
St. Mildred, Bread-Street: View looking West.

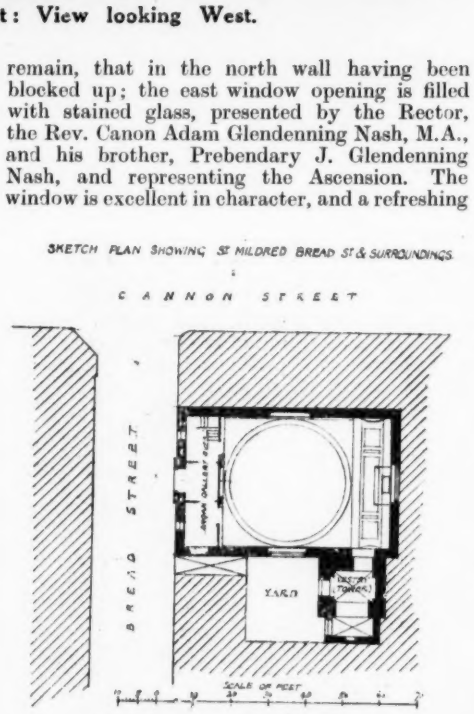
causing distortion from many points of view, which are minor defects in a conception of great beauty and imagination.

No. II.—St. Mildred, Bread-Street.

The church of St. Mildred, Bread-street, with St. Mary Abchurch and St. Swithin, form a group in which a dome or lantern covers most of the area of the church, while in a second group, to which St. Mary-at-Hill, St. Martin, Ludgate, and St. Anne's and St. Agnes, Aldersgate, belong, the plan consists of four columns with a centre feature consisting of a dome or groined crossing. St. Stephen, Walbrook, stands alone, as in it the same idea is carried out on a much more extensive scale.

St. Mildred is hemmed in by lofty buildings, which, in conjunction with the narrowness of Bread-street, prevent its slender lead-covered steeple, set back over the vestry, from being visible except from the upper parts of adjoining buildings. The front to Bread-street, though symmetrical and architectural, possesses no special points of interest. The interior is one of the most beautiful of all Wren's churches, and, if it shows less invention than St. Mary Abchurch, is characterised by greater refinement and finish. The rectangular plan is divided into three compartments, a central domed space resting on pendentives, and a bay at either end covered by an arched and panelled ceiling. In the centre of each face was a segmental headed window, three of which remain, that in the north wall having been blocked up; the east window opening is filled with stained glass, presented by the Rector, the Rev. Canon Adam Glendenning Nash, M.A., and his brother, Prebendary J. Glendenning Nash, and representing the Ascension. The window is excellent in character, and a refreshing contrast to many of the windows which destroy the harmony and character of Wren's other churches.





St. Mildred, Bread-Street.

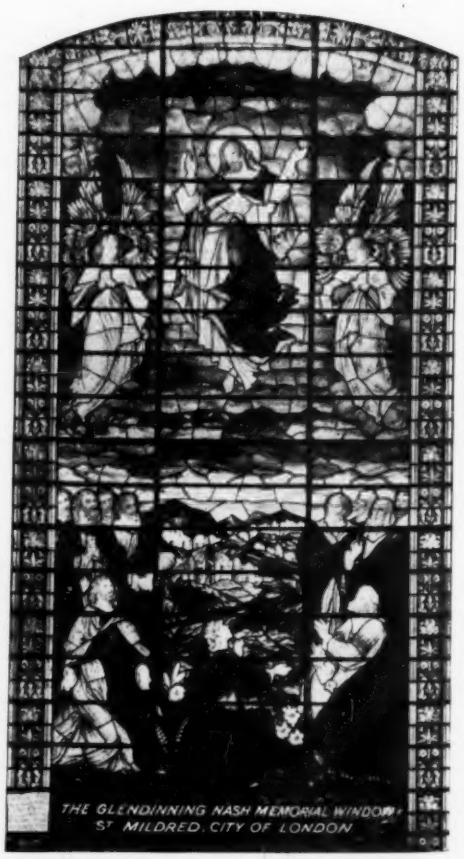
The pews remain in their original condition, and with the pulpit and organ gallery are among the finest examples of contemporary woodwork. Unlike many of the City churches, while the fabric has been carefully preserved, nothing has been done which destroys or obliterates the beauty of the design. It is frequently suggested by many writers that various City churches, especially St. Stephen, Walbrook, were "studies for St. Paul's," but consideration of the different nature of the problem set will make this seem an impossibility. Wren's churches are simple and small, depending for the most part on arrangements of single columns; while St. Paul's, like most great buildings, is a composition of piers, vaults, and structural domes. The justly famed interior of St. Stephen, Walbrook, would rather remind us in plan of some of the Spanish and Eastern mosques than any other ecclesiastical structure known to us, and the suggestions made recall the efforts of imagination which see in the vistas of a forest the prototype of the Gothic church rather than the deductions of balanced reason. The vestry contains an exceptionally valuable and beautiful Communion plate, dating back to Edward VI., Elizabeth, and Charles I., and with the very exquisite white marble font and oaken altar-table was fortunately preserved when the former church was burnt down.

The rectory was originally in the gift of the prior and convent of St. Mary Overy, Southwark; but since the days of Henry VIII. the patronage has been in private hands, and in the seventeenth century the advowson was in the gift of the Crispe family, one of whom, Sir Nicholas Crispe, who was knighted for his loyalty after the Restoration, presented the church with Communion flagons and font in Charles I.'s reign. The parish was united with that of St. Margaret, Friday-street, which was not rebuilt after the Fire. The present church of St. Mildred was rebuilt and opened in 1683.

WREN'S FIRST DESIGN FOR ST. PAUL'S.

The success of the greatest men is usually chequered by failures which seem, to them, more important than to a posterity which is ignorant or forgetful of their aims. The works of Wren are the glory of the London which we know and are proud of; but what London might have been had his magnificent plan for its lay-out been accepted we can only partially picture, and the Cathedral Church of St. Paul, which may well be termed the crown and culmination of English architectural achievement, is a success built over the grave of the most cherished hopes and ideals of a great architect. In the glory of what is we fail to imagine adequately what might have been had the opposition of the Commissioners of St. Paul's and Court prejudice been overcome. Only Wren's model remains, together with a few engravings and illustrations, and when the numerous alterations and divergencies from the accepted scheme are remembered, and allowance is made for the fact that the drawings of Wren's age are tentative diagrams, we may be partially able to realise what Wren's favourite design would have gained in the process of execution.

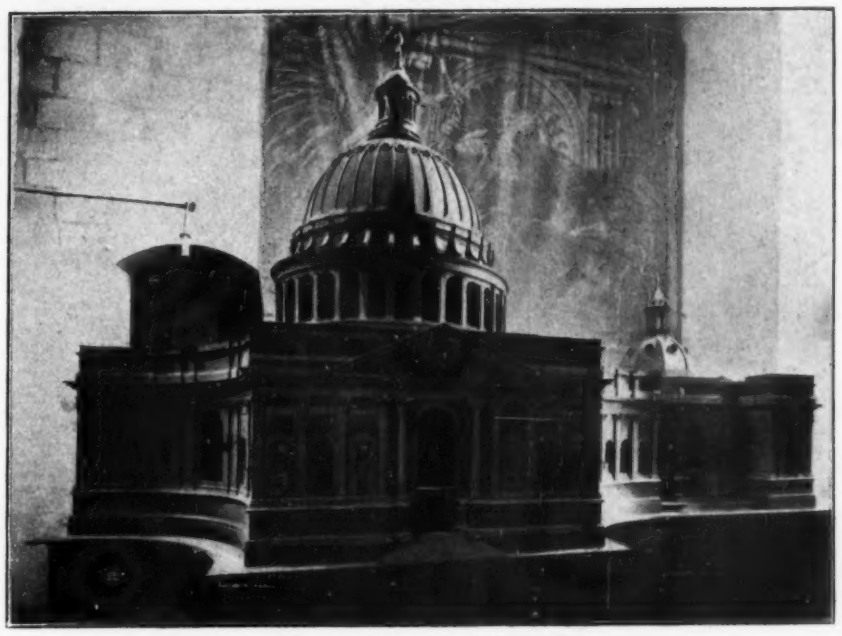
The magnificent and poetic *motif* of a dome ringed round with a number of smaller ones, and the beauty of the geometrical plan, more than counterbalance the skill of the manner in which Wren translated a mediæval plan into a Renaissance equivalent. No effects of light, shade, and form in the existing building could have compared with the variety given by the succession of dome and arched opening of the first design. Wren's genius was, by opposition, deflected into a channel in which it lost its full



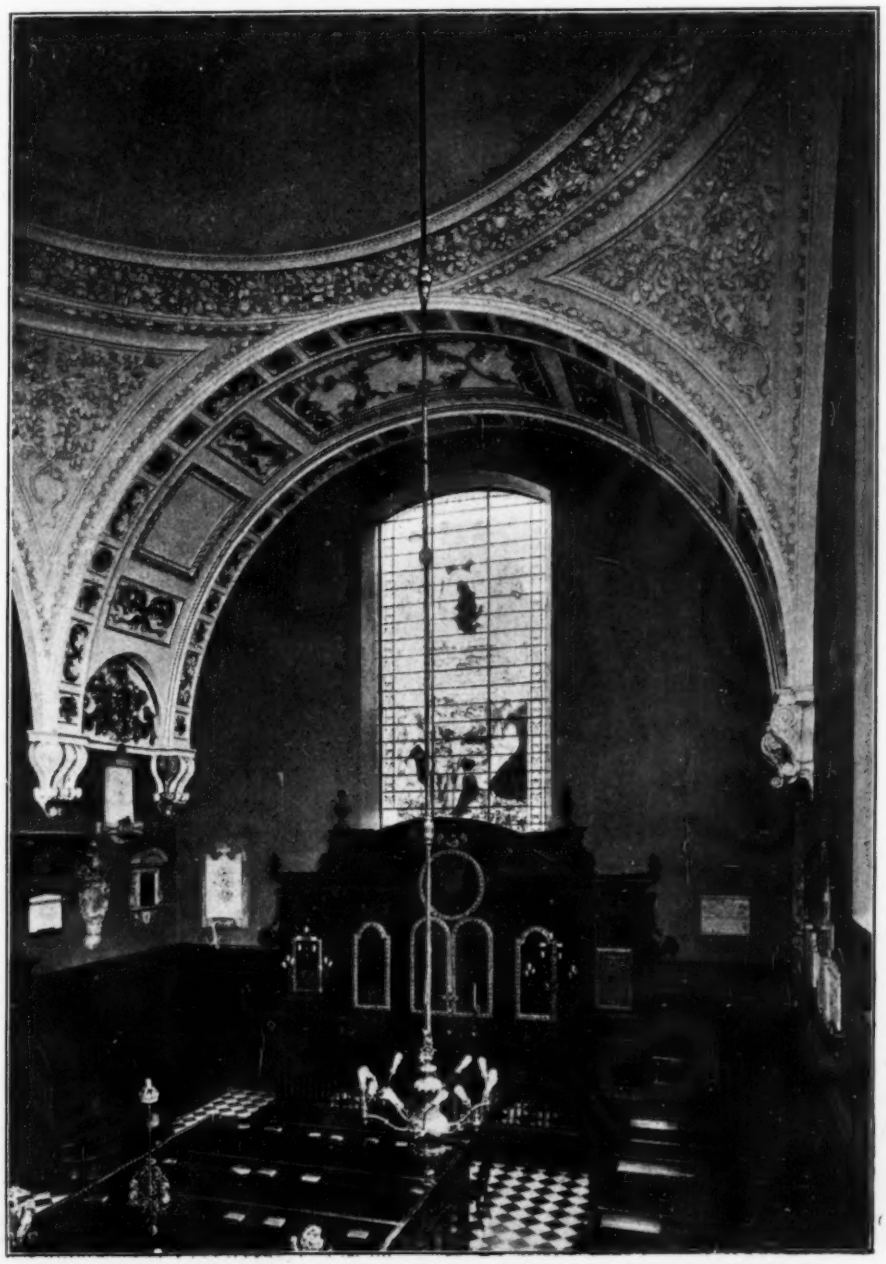
St. Mildred, Bread-Street: East Window.

force by restriction of opportunity, with the result that the ingenious devices by which such difficulties as the thrust of the vaults, the discordance between interior and exterior were met, not to mention the structure of the internal and external dome, have become a battle-ground between those who somewhat importunately urge that architecture should be "clothed construction" and others who do not preface a logical defence by the admission that it is preferable to avoid any such expedients without loss of architectural effect. In short, while there is no necessity for an internal and external feature to correspond, we may reasonably be glad that it is possible to make them do so, and in Wren's favourite design this correspondence would have been an exceedingly close one. Many of the criticisms made by those who judge of the scheme from drawings are dispelled by a study of Wren's model. The great dome is set back almost at an equal distance from all faces of the church except the west extension—which may be described as a narthex rather than a nave—and would have been given its full effect. Fergusson alludes to the concave curves which connect nave, transepts, and choir as being disturbing to the repose and quiet grandeur of the building; but the treatment is seen to be justified by the model. The objection to the treatment of the elevation by "plastering it with a series of gigantic and useless Corinthian pilasters" is a criticism which might be applied to the present Cathedral, as well as to many of the great works of ancient Rome and the Renaissance masters, and is hardly germane to the matter under discussion. The point about which most doubt may reasonably be expressed is as to the effect of the second external dome which "surmounts the nave"; but this might have justified itself in actual execution, while it cannot be considered an essential feature of the design which would have been actually carried out, any more than the extraordinary features of the "Warrant" design were. Other critics regret the absence of the campaniles of the first design, but they might well have been developed from the plan in execution, being as much suggested by the plan as by that of the executed design. In fact, if we judge by the difference between the "approved draughts" and actual buildings of the time a great mass of the criticism levelled at this design becomes meaningless, while the broad contention that Wren's judgment in this and other matters would have been justified by results appears to become a reasonable hypothesis. The most practical criticism of the plan, that it was in some ways ill-adapted for its purpose, as the high altar could only be seen from about half the area of the church, is a more serious one, though less so than would have been the case either in past or subsequent ages of the history of the church. The criticism of the exterior treatment of the rejected design, with its one Order and attic, is based, first, on the omission to recognise that whatever may be lost in the substitution of a single Order for the two in the existing building, the former is a logical expression of the interior, while the other is not; and, secondly, in the failure to recognise that the suggested treatment is only a groundwork on which Wren would have worked, probably with a result which would have defied criticism. The criticism that the dome of the rejected design would have been overwhelming in effect raises the question of what our aim should be in the design of a domical church. In Sta Sophia the dome, with its two semi-domes, constitutes the church, yet we do not say it is overwhelming. To a large extent the dome in Wren's first design constitutes the Cathedral, everything else being grouped round it and subordinated to it. It is not a central feature so much as the church itself, and, being so, it may reasonably and properly dominate the whole group to an extent which would be inappropriate in the case of the present dome, which may be termed a central feature marking the crossing. Wren's design in reality forms an intermediate stage between buildings of the type of St. Paul's and St. Peter's, in which the dome is the most important feature, and structures like the Pantheon and Sta Sophia, in which the dome constitutes the building itself, so that criticism which may apply to the typical historical Cathedral of the West becomes inapplicable, and we have to free ourselves from the memory of mediæval precedent before we can judge of the result dispassionately. Lovers of the Renaissance are frequently more influenced by the Gothic traditions in matters of form than they think—a fact which colours our opinions on ecclesiastical architecture.

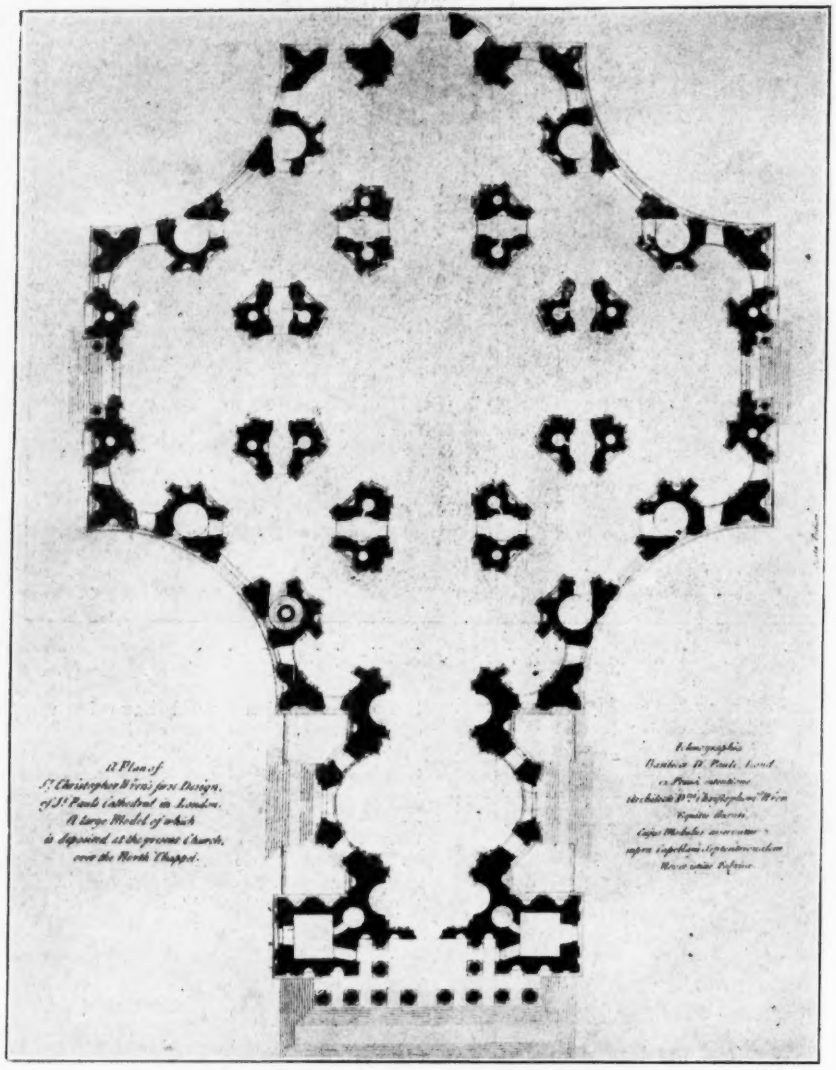
Apart from this criticism, authorities have generally been in agreement in their recognition



Wren's Model for St. Paul's (First Design).



St. Mildred, Bread-Street: Interior looking East. (*See page* 8.)


A Plan of
S^r Christopher Wren's first Design,
of S^t Pauls Cathedral in London.
A large Model of which
is deposited at the present Church,
over the North Chappel.

Wren's First Design for St. Paul's.

that the internal effects of the rejected scheme would have surpassed those of the present Cathedral. It was, in fact, a completer break with mediævalism, and rested on the fuller adoption of the principle of the dome instead of that of the vault as the dominating *motif*. The existing building is a vaulted church with a central dome—a Renaissance version of Ely; while the rejected design departed as far from existing precedents as Wren's City churches do from their mediæval prototypes. Despite the criticisms which have been made by authorities, and with full recognition of the debt we owe to a great genius, we feel that his own individuality pointed the way to the fullest realisation of the full possibilities of the art of architecture employed by a master, and that the epitaph, "Si monumentum requiris circumspice," might have had even greater meaning had it been inscribed in the building of Wren's own choice instead of the existing Cathedral.

HOUSING CONFERENCE AT GLASGOW.

Eight hundred delegates attended the first Scottish National Conference on Housing held in Glasgow on the 3rd inst. under the auspices of the local Labour Party Housing Committee. The Chairman, Mr. William Gallagher, of the Scottish Co-operative Society, characterised the stoppage of the house rent increases as a great victory for working-class solidarity. Dr. Chalmers, Glasgow Medical Officer of Health, said the quickest way to cut down the price of land in the cities was to cut down the height of tenement houses. The time had come when the abolition of the apartment houses should be considered. Councillor Wheatley said the famine in houses in Scotland could be traced in a measure to combines among manufacturers of building materials. Private building enterprise had failed. He outlined a labour scheme for free State house-building grants.

GENERAL NEWS.

Appointment.

Mr. Arthur F. Holden, Deputy City Surveyor and Engineer, Coventry, has been appointed Borough Surveyor and Engineer to the Corporation of Hereford.

Deceased Architect's Estate.

The late Mr. Arthur Rowland Barker, of Grove House, the Green, Southgate, Middlesex, who died on October 26, and was for more than forty years architect and surveyor to the diocese of Winchester, has left estate of the gross value of £27,859.

Collapse of West-End House.

The roof of No. 28, George-street, Hanover-square, a three-story building, fell during a gale a few nights ago, and the whole of the interior of the building down to the ground floor collapsed with the weight of the falling *débris*.

The Surveyors' Institution.

The next ordinary general meeting of the Surveyors' Institution will be held in the Lecture Hall of the Institution on Monday, January 10, when a paper entitled "Some Notes on Reinforced Concrete" will be read by Mr. R. M. Kearns (Fellow). The chair will be taken at five o'clock instead of eight o'clock.

Carpenters' and Joiners' Evening Classes.

A protest against evening classes where carpentry and joinery are taught has been made to the Executive Council of the Amalgamated Society of Carpenters and Joiners by some of the members. They complain that partially-skilled lads and young men use their knowledge gained at these classes to secure work at reduced wages.

The Building Trades, Berlin.

It is stated that the Berlin Chamber of Commerce in its yearly report claims that, except in the building trades, the situation at the end of 1915 is more satisfactory than anybody expected a year ago.

Dominions Offices in the Strand.

We understand that the Governments of New South Wales and South Australia have authorised their respective Agents-General in London to enter into negotiations with the London County Council and the Duchy of Lancaster for the acquisition of a joint lease of certain property in the Strand, near Savoy-street, as a site for Government offices for the two States named. The property referred to adjoins the new offices of the Western Australian Government Agency, and is of an area sufficient to allow of the erection of offices thereon for the accommodation of both the New South Wales and South Australian Agents-General and their staffs.

Art Treasures and Aircraft Raids.

The *Times* understands that the Office of Works recently summoned a conference, which was attended by representatives of the Admiralty and the War Office, and to which the directors of the great museums and art galleries were invited, to consider whether any further steps could be taken to safeguard national monuments against aircraft raids. The naval and military experts present unanimously agreed that no public building could by any structural device be protected against attack by bombs. Steps have, however, been taken to protect as far as possible the chief art treasures of the country. The care of ecclesiastical buildings actually in use was specially excluded from the control of the Office of Works under the Ancient Monuments Consolidation and Amendment Act, and all responsibility devolves on the Dean and Chapter or other ecclesiastical authority.

Steel Huts in the War Zone.

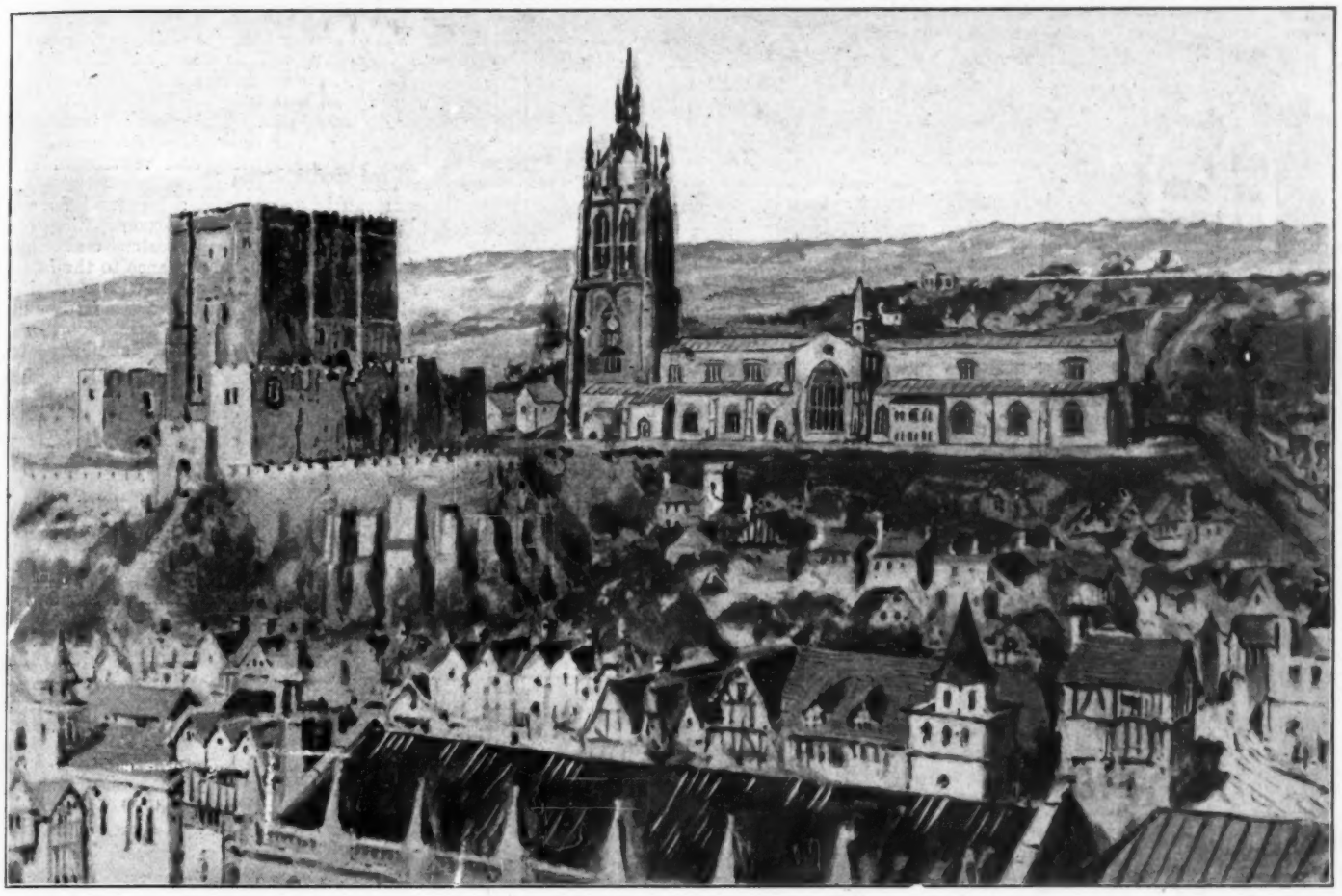
According to American reports the Allied Powers (a report of the British Steel Smelters' Association states) intend to erect vast numbers of portable steel dwelling-houses for the use of the soldiers at the front and also as homes for the inhabitants of territory which has been devastated by the war. It is said that France plans to build 100,000 such dwellings, and other Allied Powers are expected to erect a proportionate number.

Housing Problem, Huddersfield.

The housing problem has become acute at Huddersfield. For some years the rate of building of dwelling-house property has not kept pace with the ordinary increase of population due to the steady growth of industries, and now, in addition to the needs of the other new or expanding industries, provision must be made for the 20,000 or 30,000 workpeople who will be employed by British Dyes, Ltd. The initial efforts of the Huddersfield Corporation to provide working-class dwellings have been almost entirely confined to the substitution of tenement dwellings to make up for the gradual condemnation and closing of the many cellar dwellings. Since the passing of the Housing and Town Planning Act various schemes have been carried out and others have been begun—notably the purchase of the Royds Hall Estate, at Paddock—but their completion has been delayed by the war.

"British Dominions Year-Book."

We have received a copy of the "British Dominions Year-Book, 1916" (1, Royal Exchange-avenue, E.C.), in which we notice several articles of interest, including contributions by Mr. E. Charles Vivian, Mr. Fred T. Jane, Mr. Edgar Crammond, Mr. Edward Salmon, Sir Leo Chiozza Money, Sir Laurence Gomme, Mr. J. Ellis Barker, Mr. H. Massac Buist, Mr. C. G. Grey, Lady St. Helier, and others. Sir Leo Chiozza Money's article shows the opportunity which now presents itself for utilising the resources of the Empire for the benefit of the British people. The "British Dominions Year-Book" is not published in the ordinary way, but will be presented to public and business men and women.



Portion of Model of Old Newcastle.

By Mr. John P. Thorp.

(Presented to the Laing Art Gallery and Museum, Newcastle.)

ILLUSTRATIONS.

Russian Mediæval Architecture.

WE give illustrations of one of the historic mediæval churches of Moscow, together with a descriptive article on page 12. The mixture of Asiatic and Byzantine types renders Russian architecture exceedingly interesting, if a little strange to Western standards.

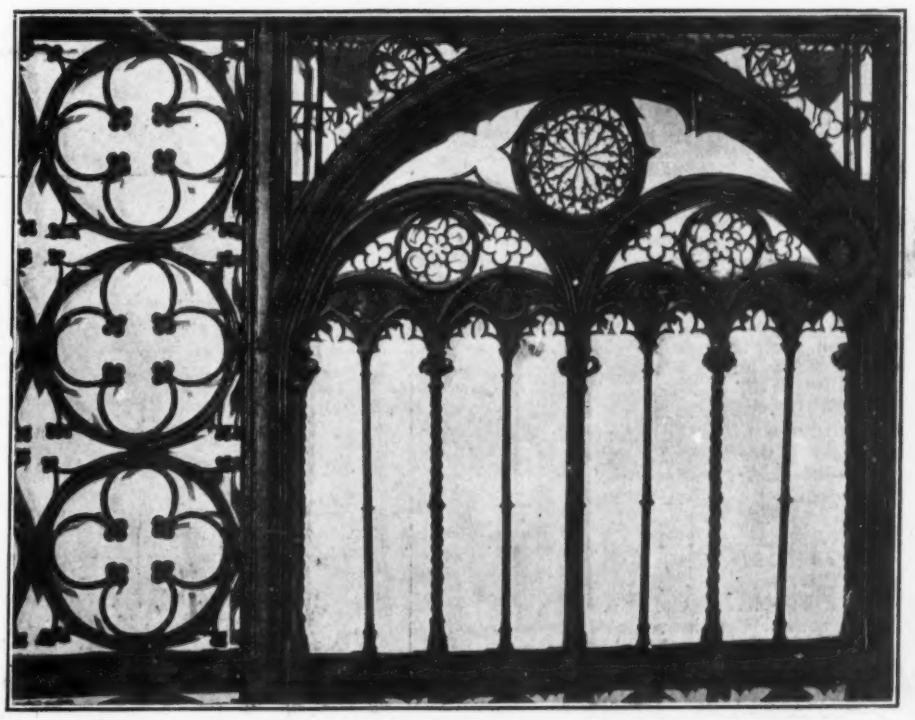
Old Newcastle.

THESE illustrations are from photographs of a portion of a model by Mr. John B. Thorp, of Gray's Inn-road, London, W.C. The model is of Newcastle in the reign of Queen Elizabeth, and shows practically the whole of the town within the city walls. One of the photographs shows the old bridge, and the other the Castle and Cathedral, with the roof of the Customs House in the foreground. The model has been executed to a scale of $\frac{1}{200}$ full size, and has been presented to the Laing Art Gallery and Museum, Newcastle, by Lord Joicey and Mr. John G. Joicey.

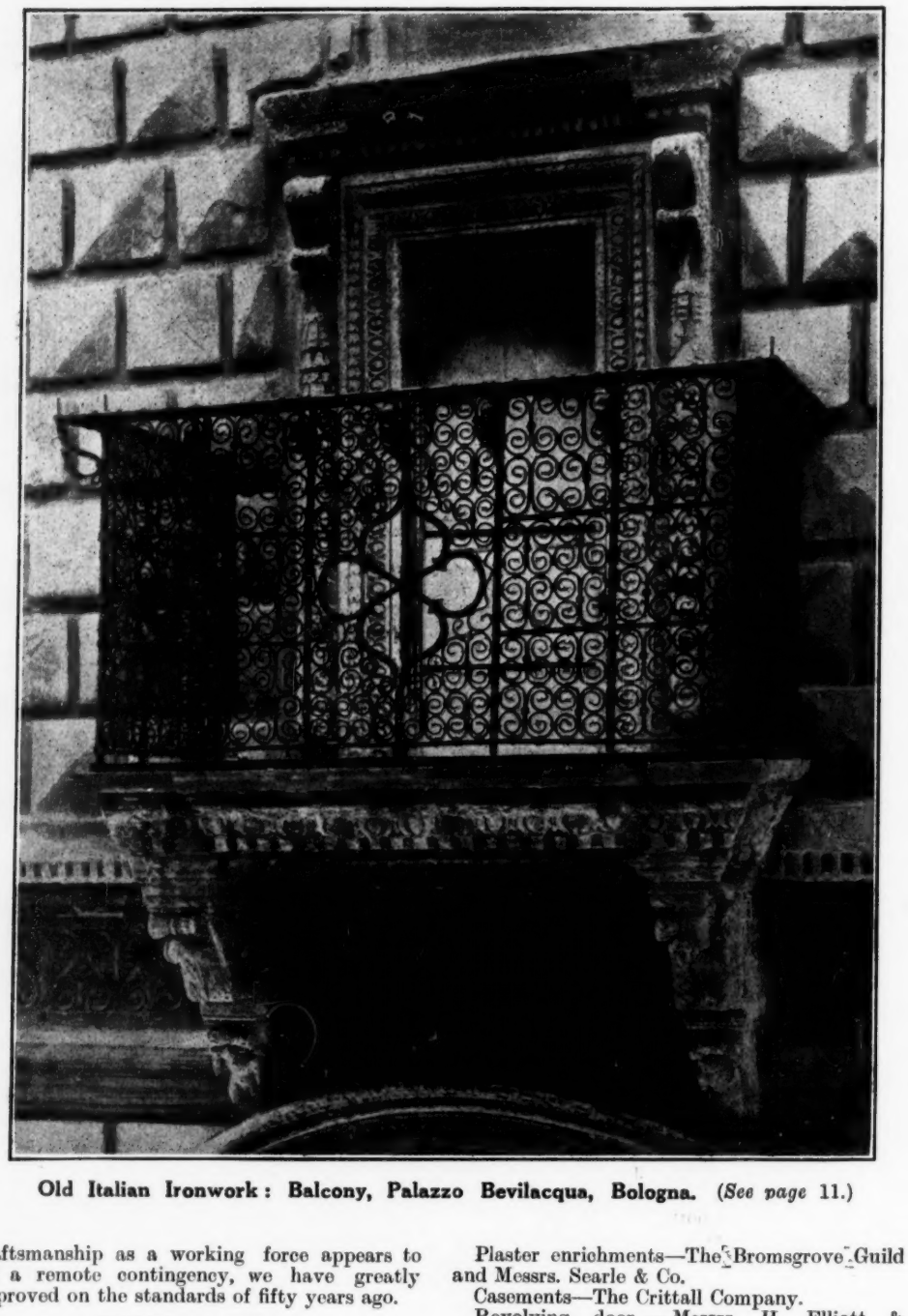
The Emperor Hadrian built the first stone bridge across the Tyne in the year 120. It consisted of stone piers, on which was laid a timber roadway. In 1248 the timber roadway was destroyed by fire and the piers were considerably damaged. The bridge was rebuilt, practically on the same foundations, and finished with stone arches. In 1339 it was very much damaged by floods, and 120 people were drowned. The bridge was covered with houses, as shown in a view dated 1739. The houses not only projected over the bridge, but also encroached upon the roadway. There was only room for goods to go over on packhorses; other modes of transit along the bridge would have been impossible. There were three towers on the bridge—the Gateshead Tower on the south, the Prison Tower near the middle, and the Magazine Tower on the Newcastle side. There was also a chapel on the bridge, mentioned in 1616, called Our Lady's Chapel. The Magazine Gate had a date of 1636 upon it. The bridge, which replaced that of Hadrian, had one great fault: its piers were so wide as to greatly impede the passage of the waters. The bridge originally consisted of twelve arches. When the quays of Newcastle and Gateshead were built three of these were absorbed by the works and the whole body of the waters made to pass through the remaining nine arches.

Old Italian Ironwork.

WE give further illustrations of Italian ironwork, for the greater part of seventeenth and eighteenth century date. Its delicacy and fancy distinguish it from the corresponding work in England and France, while it is usually simpler and less ornate than the work of the Spanish smiths. The want of craftsmanship in smith's work is more needed to-day than in almost any other of the callings connected with building; but, though the revival of



Old Italian Ironwork: Detail of Chancel Screen, Capella Rinuccini, Florence.



Old Italian Ironwork: Balcony, Palazzo Bevilacqua, Bologna. (*See page* 11.)

craftsmanship as a working force appears to be a remote contingency, we have greatly improved on the standards of fifty years ago.

Ocean Marine Insurance Company's Offices.

THE Ocean Marine Insurance Company, Ltd., last year decided to demolish their building in Old Broad-street and to erect the present imposing building. This has been designed by Messrs. Thompson & Walford, of Leadenhall-buildings, E.C., who have given regard to the extreme value of the space here and likewise to the narrowness of the street at this point. It is one of the highest buildings in the City, comprising as it does some ten stories. The façade has Italian granite for the two lowest floors, with bronze enriched openings and Portland stone above.

The building contractors are Messrs. Geo. Trollope & Sons and Colls & Sons, Ltd., Coleman-street, E.C., and the clerk of works is Mr. F. Thomas. The following is a list of subcontractors:—

Steelwork—Messrs. Redpath, Brown, & Co.
Carving—Messrs. H. H. Martyn & Co.
Italian granite and marble—Messrs. J. Whitehead & Sons.
Biancola wall linings and steps—The Art Pavements and Decorations, Ltd.
Lifts—Messrs. Waygood-Otis, Ltd.
Electric light—Mr. F. Geere Howard, who was also responsible for the ventilation.
Electric light fittings—Messrs. Osler and Mr. F. Geere Howard.
Heating—Messrs. Colls & Sons.
Bronze entrances—Messrs. Singer & Co.
Staircase enclosures—The Bromsgrove Guild.
Plaster enrichments—The Bromsgrove Guild and Messrs. Searle & Co.
Casements—The Crittall Company.
Revolving door — Messrs. H. Elliott & Co.

The fire-resisting glass, part of the gun-metal windows, lantern lights, ceiling lights, pavement lights, and stallboard lights were by the Luxfer Company.

Public Trustee Offices, Kingsway.

THIS building occupies a site having frontage to Kingsway, Sardinia-street, and Lincoln's Inn-fields. The elevations are of Portland stone with a granite base to the height of the ground floor window-sills. The plan of the building is in the form of three sides of a square, with a large well for lighting and ventilation in the middle.

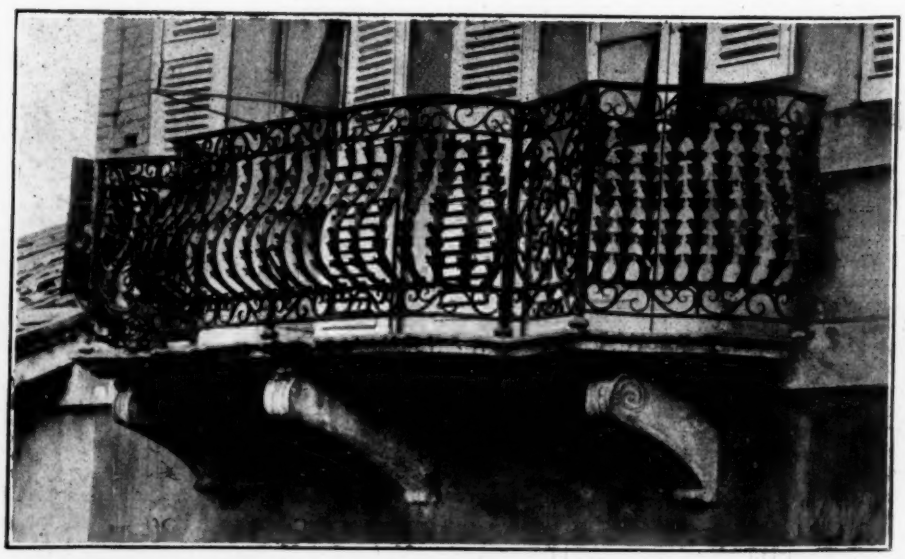
In the basement and sub-ground floors are placed the numerous strong-rooms, filing-rooms, storerooms, heating apparatus and pumps, motor-room, etc. The entrance to the building is from Sardinia-street, with subsidiary entrances, which at present are not to be used, in Lincoln's Inn-fields. All the floors except the top floor are practically similar in their arrangement with the principal rooms on the second floor. The whole of the top floor is given over to luncheon-rooms, etc., for the use of the staff. Three passenger lifts are provided, and also small lifts for the quick conveyance of papers, etc. A system of vacuum cleaning pipes has been installed throughout the building.

The purpose for which the building is intended, viz., a block of offices, has been strictly kept in mind in the design and execution of the work. The walls throughout, except in the entrance hall and lavatories, are plastered and distempered. Those of the entrance hall are of "Stuc" material, and the lavatories white glazed bricks. The floors of the rooms are of maple blocks, and those of the corridors and lavatories are of terrazzo. That of the entrance is of marble tiles.

Messrs. Kingerlee, Oxford, carried out the foundation contract, and Messrs. Galbraith Brothers, Camberwell, that for the superstructure. The following is a list of the various subcontractors:—

Wood block flooring—Messrs. Burgess & Co., Liverpool.
Terrazzo—Bell's United Asbestos Company.
"Stuc" work—Mr. H. Tanner.
Marble flooring—Messrs. Anselm Odling & Co.
Steel sashes—Taylor Manufacturing Company, Wolverhampton.
Heating—Messrs. Cannon & Hefford.
Asphalt—French Asphalte Company and Val de Travers Asphalte Company.
Railings—Messrs. Humphries, Jackson & Ambler.
Wrought-iron grilles and special door furniture—Messrs. Whiteside & Carslake.
Lifts—Messrs. Aldous & Campbell.
Boilers setting—Messrs. Strode & Co.
Granite work—United Stone Firms, Ltd.
Portland stone—Bath and Portland Stone Firms, Ltd.
Strong-room doors—The Ratner Safe Company.
Vacuum cleaning system — Sturtevant Engineering Company, Ltd.
Metal shelving—Messrs Estler & Co.

The building has been designed by and carried out under the supervision of H.M. Office of Works.



Old Italian Ironwork: A Seventeenth-Century Balcony, Cremona. (*See page* 11.)

New Premises of the Phœnix Assurance Company, Ltd.

THE new premises of the Phœnix Assurance Company occupy a site of about 12,000 sq. ft., with frontages of 37 ft. to Abchurch-lane, 145 ft. to King William-street, and 143 ft. to Sherborne-lane. With so large an extent of frontage the construction of the retaining wall, which was carried out in reinforced concrete, was a matter requiring much time and care. The building itself, which is eight stories in height, including two basements and one story in the roof, is a steel-frame structure, and the floors are on Messrs. Homan & Rodger's system. The staircases throughout are in reinforced concrete, with York stone treads and risers.

The main façade is 78 ft. high. The ground-floor story forms a basement stage, with arched windows and rusticated stonework; the first floor is treated as a pedestal to the Corinthian Order which embraces the second and third floors; while the fourth floor forms an attic above the main cornice. The whole of the front is in Portland stone, worked at Messrs. Trollope & Colls' yard, with the exception of the plinth stones and the central and side entrances in King William-street, all of which are in grey unpolished Aberdeen granite.

The interior of the Phœnix Company's main office, which occupies the central portion of the ground floor, is finished in marble, Piastraccia being used for the wall linings and Campan Vert for the columns and pilasters. This office is dominated by a central feature of octagonal form, which rises through the first floor with an arcaded gallery, and is surmounted by a large dome light, 20 ft. in diameter and 40 ft. above the floor. No little difficulty was experienced in obtaining the necessary supplies of marble, and the building still lacks the marble columns and pilasters in the main office, which have had to be finished temporarily in plaster

The Phœnix Company itself occupies by far the greater portion of the premises; but five floors from sub-basement to second floor on the portion of the site at the corner of Abchurch lane are leased to the National Bank of Egypt, while the three floors above this are available for letting, as are also a good ground floor office with basement at the corner of Sherborne-lane and other offices approached by a side entrance further up that street.

The electrical work was carried out under the direction of Mr. S. G. Castle Russell, the company's consulting engineer. The lighting is by a semi-indirect system from ceiling pendants, which gives a soft and pleasing effect. No desk standards are used. The heating is by hot water. A system of forced ventilation has been provided in the basements, but the whole of the rest of the building is ventilated by fresh-air inlets behind the radiators and exhaust ducts connected with electric fans on the roof. The two artesian wells, installed under the direction of Mr. Albion T. Snell, have borings 450 ft. deep.

The general contractors were Messrs. Trollope & Colls, for whom Mr. Doust acted as foreman on the works. The building was carried out from the designs and under the direction of the architects, the late Mr. J. Macvicar Anderson and his son, Mr. H. L. Anderson, and much valuable assistance in the planning of the premises and in other directions was received from the company's chief surveyor, Mr. Frederick Izant. The quantity surveyors were Messrs. Franklin & Andrews, of No. 25, Ludgate-hill, E.C., and Mr. H. England, of No. 64, Victoria-street, S.W.; and Mr. A. Nisbet has acted as clerk of works.

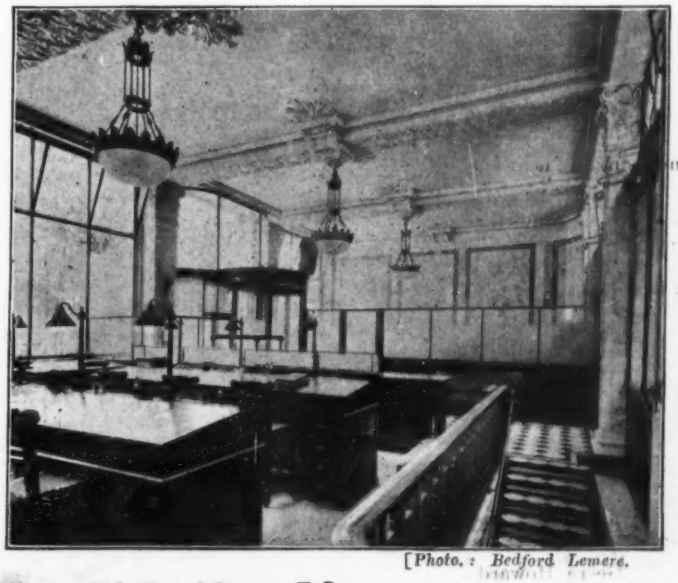
The following is a list of subcontractors:—

Constructional steelwork and floors—Messrs. Homan & Rodgers.

[*Photo.: Bedford Lemere.*

Ocean Marine Insurance Company's Offices, Old Broad-Street, E.C.

Messrs. Thompson & Walford, Architects. (*See page* 12.)



[*Photo.: Bedford Lemere.*

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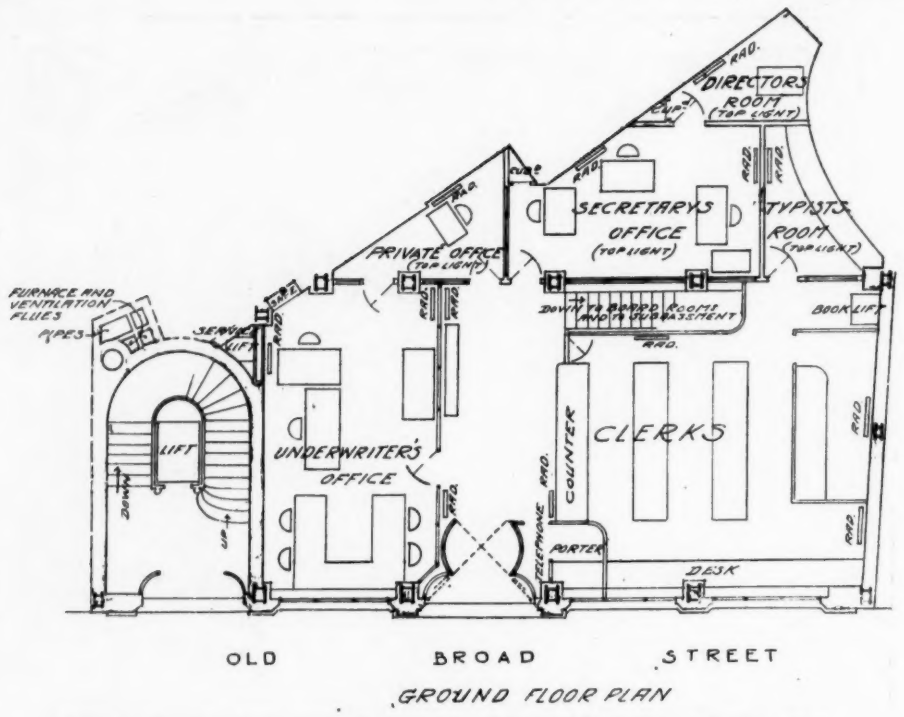


Ocean Marine Insurance Company's Offices, Old Broad-Street, E.C.

Messrs. Thompson & Walford, Architects. (*See page* 12.)

Granite work—Mr. John Fyfe, Aberdeen.

Marble work and mosaic floors—Messrs. Burte & Co.

Glazed brickwork and faience work—Leeds Fireclay Company.

Stone carving and bronze "Phœnix"—Mr. C. H. Mabey.

Wood and marble carving—Mr. Geo. Hawkings.

Wood block floors—Acme Flooring and Paving Company.

Chimney-pieces and stoves—Messrs. Shuffrey & Co.

Ironmongery—Mr. James Gibbons.

"Koperoid" windows and steel fittings—Crittall Manufacturing Company.

The large central dome in the main hall of the Phœnix office, also the domes in the office of the Bank of Egypt, the windows to light basement in coppered iron, fitted with electro glazed prisms, all the fire-resisting glazing, and the Luxfer Special Pavement Lights were by the Luxfer Company.

Balconettes and stallboard grilles—Messrs. H. H. Martyn & Co.

Lift enclosures and other ornamental metal work—Messrs. H. W. Cashmore & Co. and Mr. W. Shrivell.

Strong-room doors and steel fittings—Milner's Safe Company and Messrs. Chubb & Sons.

Plaster work, plain and decorative—Mr. James Annan and Messrs. H. H. Martyn & Co.

Wall tiling—Messrs. James Annan and Messrs. Martin Van Straaten & Co.

Drainage and sanitary work—Messrs. Trollope & Colls.

Sanitary fittings—Messrs. Dent & Hellyer.

Glazing—Messrs. Alfred Goslett & Co.

Passenger lifts—Messrs. Waygood-Otis.

Electric lighting, bells, and telephones Messrs. Belshaw & Co. and Messrs. Finch & Wheeler.

Electric light fittings—Messrs. Verity's.

Heating and ventilation—Messrs. Strode & Co. and Messrs. James Slater & Co.

Artesian wells—Messrs. Alfred Williams & Co.

Pneumatic tubes—Lamson Pneumatic Tube Company.

Fire hydrants—Messrs. Merryweather & Co.

Drying the building—Turk System Drying Company.

Wren's First Design for St. Paul's.

WREN'S first design for St. Paul's is known chiefly by small and inadequate illustrations in architectural text-books, and we have tried from the existing material to give our readers a better idea of the design than can be usually gathered. The magnificent model of it in St. Paul's can neither be adequately seen nor photographed in its present position in the Cathedral. It should be placed in a suitable position in South Kensington Museum and, we may add, repaired. Our views of it show the columns of the portico as they would appear if the missing ones were replaced. We give a descriptive article on page 8.

The Frieze of the Parthenon.

THESE illustrations are the expression of the author's views as to the original state of portions of the Parthenon frieze.

The height of the frieze is but little over 3 ft. About 290 ft. of its length, which decorated the exterior of the cella of the Parthenon, were recovered from the hands of the Turks and brought to England by Lord Elgin in 1803, and sold to the English Government and placed in the British Museum. A large portion is still in its original place on the southern side of the cella. Some portions are in the Acropolis Museum, Athens; and casts of some of the portions not brought away are in the Louvre and in the British Museum.

The relief of the figures is nowhere much above 3 in. The whole would probably have been fairly perfect to-day had it not been for the bombardment by the Turks in the eighteenth century. The director of artillery was, however, on this occasion a German. Kultur then, as now, was manifesting its value.

At the present moment the portions in possession of the British Museum are carefully packed and consigned to the cellars, in order to protect them from any further effects of Kultur.

A restoration on a minute scale (only 3 in. or 4 in. high) was made in 1829 or 1830 by John Henning. Later, the same artist produced the large restoration which is to be seen on the exterior of the Athenæum Club.

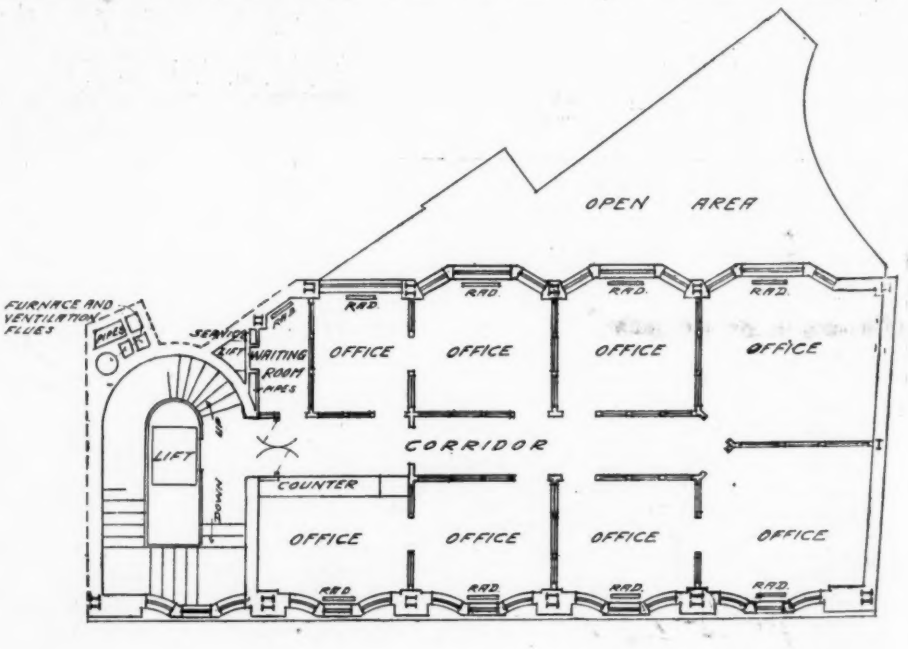
This latter includes, I think, the entire ninety-two groups which formed the frieze when complete. There have, in fact, been several restorations made at one time and another. A modern instance is to be seen at Cardiff in the newly-erected Empire Theatre in that city.

A. C. C.

OLD LONDON BRIDGE AND ITS APPROACHES.

THE subject of bridges is an exceedingly interesting one, as they are a type of building which is often impressive because of the element of size and the juxtaposition of water, for the usual purpose of a bridge is to carry a roadway over a ravine or depression, which in most cases means a stream or river. While other great monuments are generally detached from the requirements of utility, bridges are a necessity, and their appropriate design and decoration become an object of the first architectural importance. In former days bridges frequently carried buildings and covered ways, and there seems no reason why this should have fallen into desuetude, certainly as far as covered ways are concerned, for wayfarers need protection from the storms of wind and rain which sweep along water-courses, and the provision of covered ways would add much to the picturesqueness of our great London bridges at a cost which cannot be considered as excessive, seeing the advantage gained.

Probably no structure of ancient and modern days, even the Colossus of Rhodes or the Temple of Diana at Ephesus, has aroused more interest and admiration than Old London Bridge, a drawing of which by the late H. W. Brewer accompanies this issue. Wonderful as it was in reality, the description of it, written by a Roman ecclesiastic, who



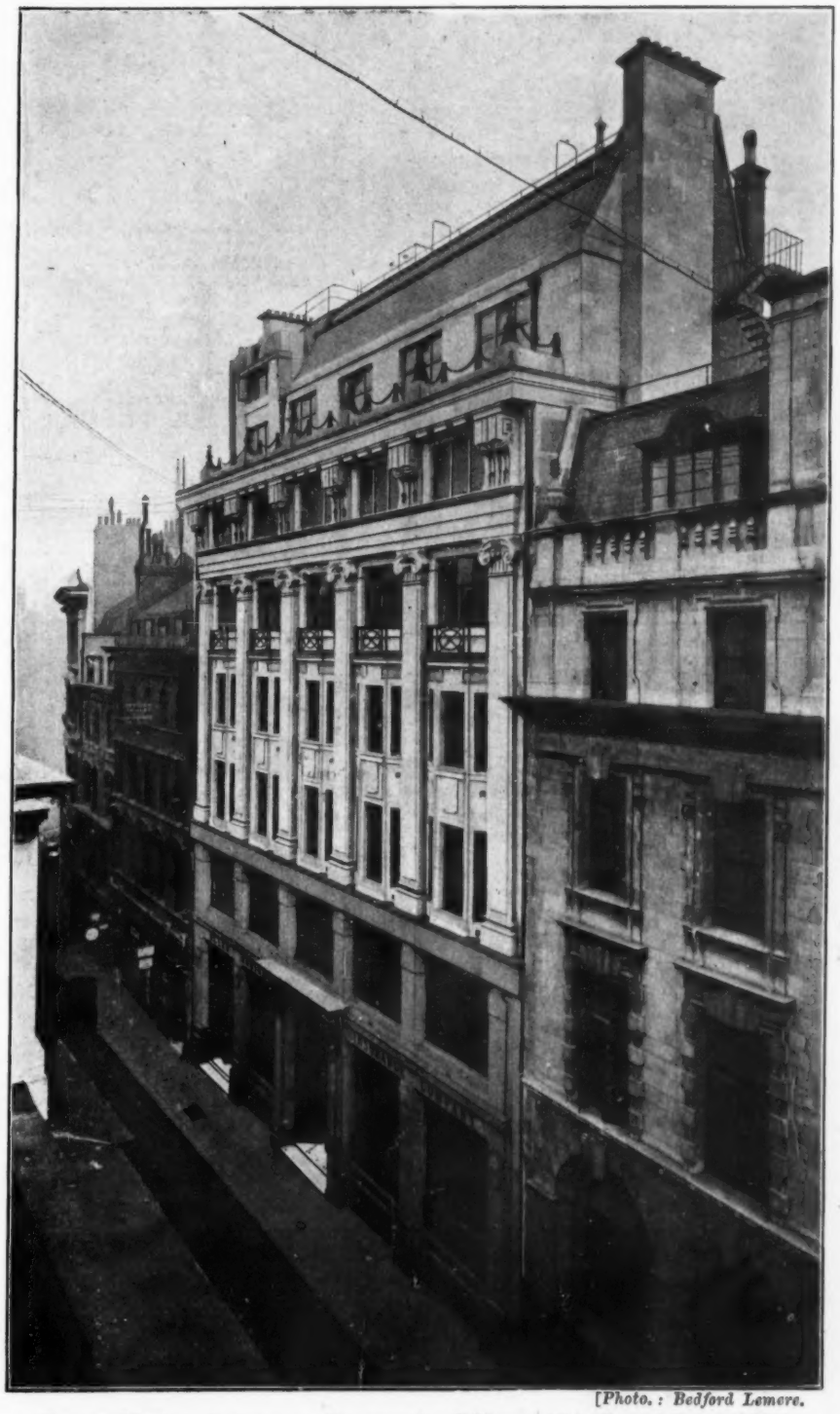
UPPER FLOOR PLANS
Lavatories & Housekeeper - Top floor.

Ocean Marine Insurance Company's Offices, Old Broad-Street, E.C.

Messrs. Thompson & Walford, Architects. (*See page* 12.)

saw it in the sixteenth century, almost equals the marvels related in the voyages of Sir John Mandeville, and we need scarcely say greatly exaggerates its grandeur. Amongst other things he describes the bridge as being a mile long, 100 ft. high, and crowned with palaces and churches. Although, of course, this is an exaggeration, yet it serves to show what a very remarkable impression this edifice must have left upon the mind of the writer, who, be it remembered, had seen the architectural glories of Italy and those of the "Eternal City." It is fortunately possible for us to recall the appearance of the ancient bridge during almost every period of its existence; the great difficulty, however, in making a restoration of it, is to avoid anachronisms, and to be certain that the various buildings shown were all in existence at the same epoch, for the changes and alterations were very frequent, owing in a great measure to the numerous vicissitudes which befell this structure, especially from fire and tempest. The first stone of "Old London Bridge" was laid in the year 1176, and it was completed in 1206. The architect was a parish priest, who is known as Peter of Colechurch. Whatever defects there may have been in the way of construction, however much the architects and engineers of later centuries, and even of the present day, may have sneered at his primitive ideas of engineering science, yet Peter of Colechurch did what probably no man ever did before or since his time—that is, he built a bridge of stone, nearly a thousand feet long, over a great tidal river, which lasted nearly seven centuries. The bridges erected by his eighteenth-century critics in London have all disappeared, and, if we may judge from the experiences of the past few years, there is little to lead us to suppose that any of the bridges erected in our day are likely to last for even one-third of the time. Although in later times the bridge was covered with houses, yet, as originally erected, the only buildings upon it were two gateways, one at either end, and the double chapel erected upon the eastern portion of the centre sterling. Probably no other buildings of any kind were erected until the close of the fifteenth century. From this time, however, the bridge came by degrees to assume the appearance of a street with breaks at intervals. At the middle of the sixteenth century these intervals between the houses were reduced to three. During the fourteenth century a tower with a gateway beneath it stood upon the seventh pier from the Surrey side, and upon this tower the heads of traitors who had been executed for high treason were exposed. In 1577 this tower was taken down, and the heads and limbs of the traitors were removed to the gate at the Southwark end of the bridge. This Southwark gate appears to have been either partly or entirely rebuilt at that period, and the magnificent structure called "Nonesuch House" was erected on the site of the ancient tower. What was the precise object for which "Nonesuch House" was erected, whether it was a Royal palace or was intended as a residence for the Lord Mayor, we are unable to say. It is stated by some writers to have been composed of timber, wrought and carved in the Low Countries, and floated piecemeal up the Thames. To judge from the representations of it, it must have borne a strong resemblance to the timber houses in Hildesheim and other towns in the north of Germany. Between the Southwark gate and "Nonesuch House" stood another very remarkable house, which was adorned with semi-circular bow windows and crowned by a battlement. That this building was of considerable importance may be gathered from the fact that its foundation-stone was laid by the Lord Mayor in state in the year 1577. Probably this building served the same purpose as the present Bridge House.

The pier upon which "Nonesuch House" stood was connected with the next pier to the south, not by an arch, but by a drawbridge, and this drawbridge has given rise to much controversy; for, as London Bridge had nineteen piers, some people maintain that it should be described as possessing twenty arches, but others more correctly maintain that a drawbridge could not be reckoned as an arch, and that, therefore, it could only be described as possessing nineteen arches; and this is the view



[*Photo.: Bedford Lemere.*

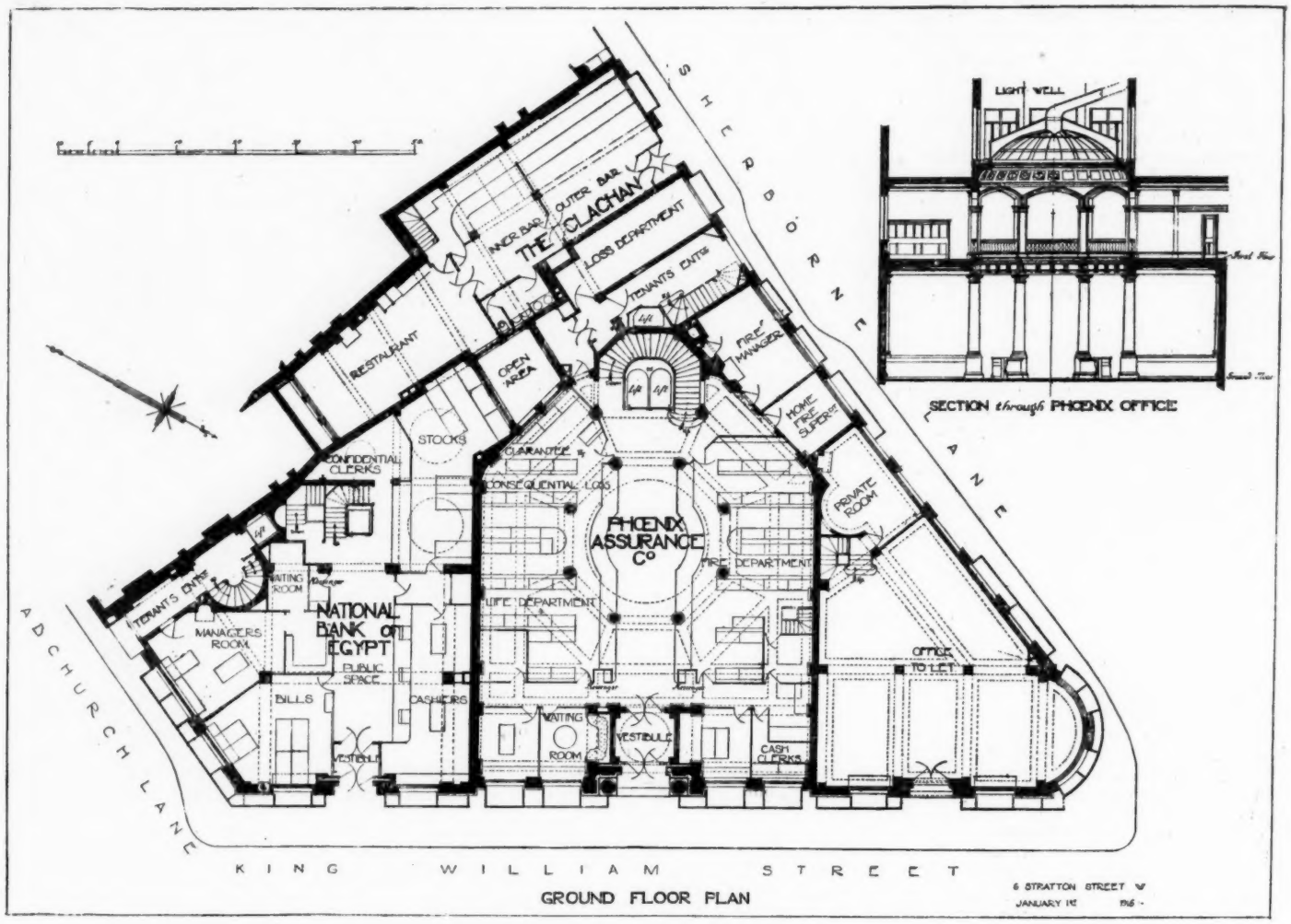
Ocean Marine Insurance Company's Offices, Old Broad-Street, E.C.

Messrs. Thompson & Walford, Architects. (*See page* 12.)

taken in a singular old poem by John Leland, entitled "Kykneion Asma," or the "Song of the Swan," a translation of which is given in the Chronicles of London Bridge, 1827. The passage we refer to is as follows:—

> The streaming river bears us on
> To London's mighty Babylon;
> And that vast bridge, which proudly soars,
> Where Thames through *nineteen arches* roars
> And many a lofty dome on high
> It raises towering to the sky.

The greatest defect of Old London Bridge was the immense obstruction to the water-way, caused by the piers and projecting sterlings. Some idea of this may be gained from the fact that, although the bridge was 926 ft. long at low tide, when the water did not cover the sterlings the "water-way" was reduced to 194 ft., and an inquiry into the dangers attending the navigation of the old bridge shortly before its destruction reveals the fact that, although the water at low tide was 10 ft. deep under the central arch, it was sometimes only 18 in. deep a few yards "below bridge." The fall of water at the ebb of the tide was often as much as 8 ft., and the "full flow" must have been equally great in the opposite direction, so that the river could only have been navigable for large barges within about an hour or so of high tide. The Thames watermen became very expert at what was called "shooting the bridge"—that is, taking a boat down the cataract without either upsetting it or going under water. The term "shooting the bridge" has remained in common use, although it does not now convey the idea of danger, which it formerly did. Our view represents the bridge at "slack water." The existing ancient views of London Bridge are very numerous; those in the Crace collection have been carefully described in the *Builder* of April 12, 1879, page 390. The earliest is an illumination dated 1419. The most important alteration which London Bridge underwent were in 1759, when the great centre pier was removed and replaced by an arch, and the houses on the bridge were removed. Attached to the approaches of London Bridge were several buildings of considerable interest. At the London end stood the Church of St. Magnus, which was destroyed by the Great Fire in 1666, and was subsequently rebuilt by Wren, and on the opposite side of

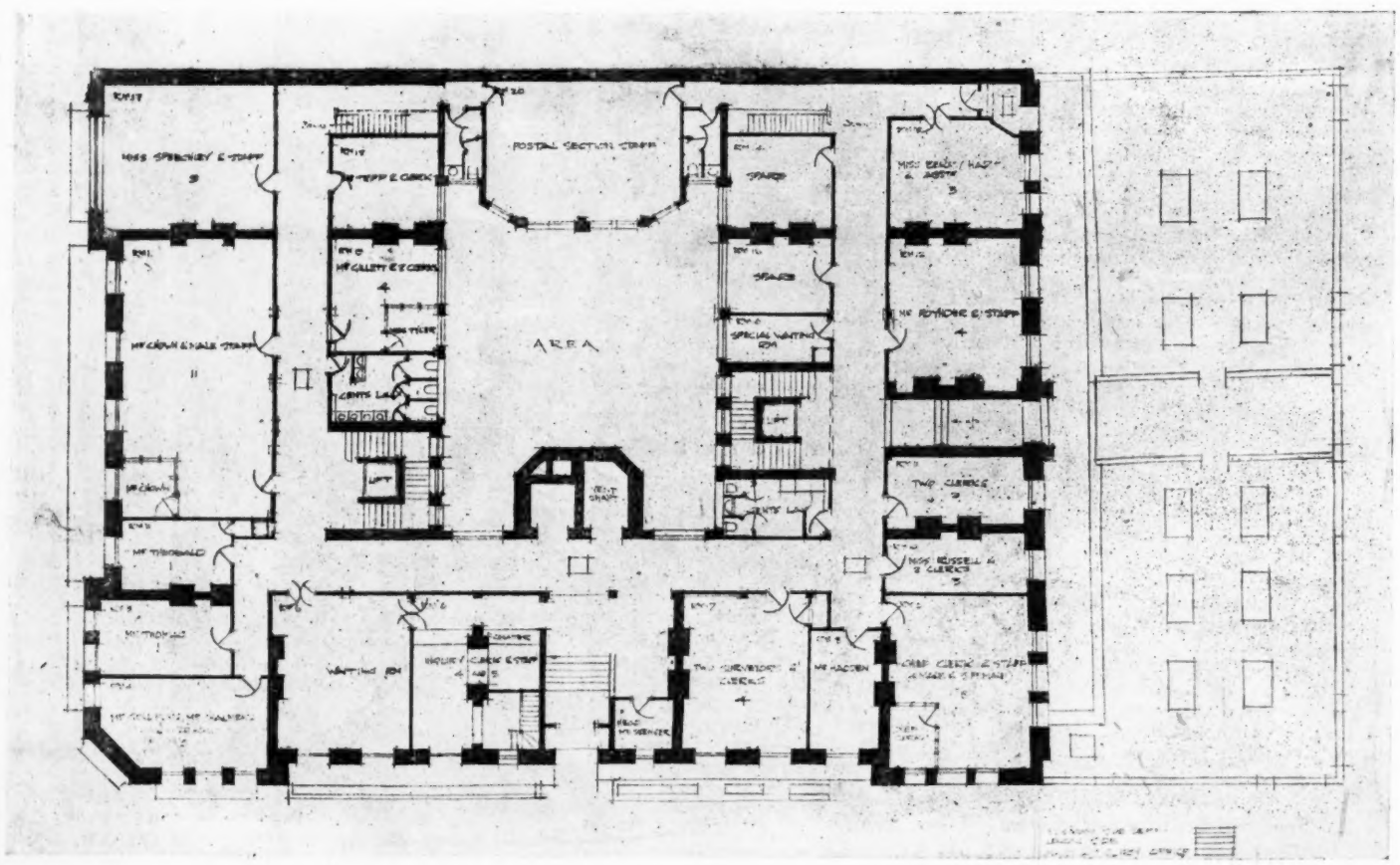


Phœnix Assurance Company's Offices.

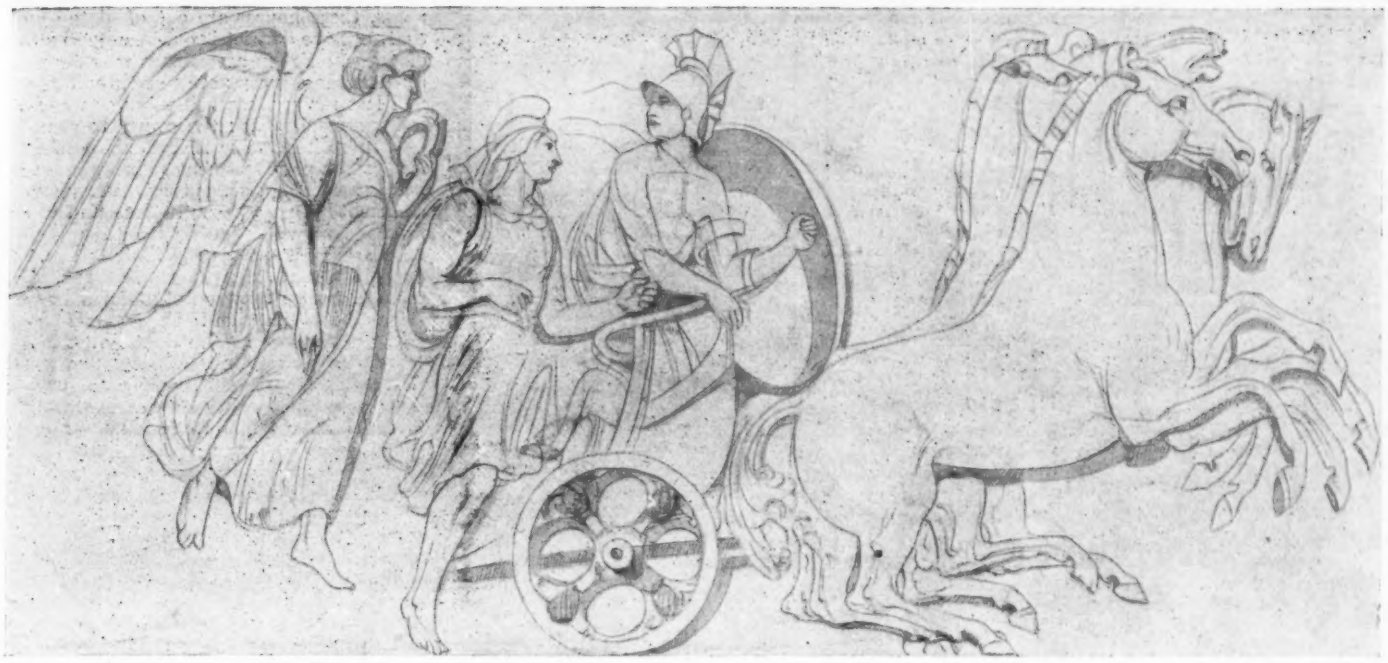
The Late J. Macvicar Anderson and Mr. H. L. Anderson, Architects. (*See page* 13.)

the road were erected the first London waterworks; they seem to have possessed a lofty and picturesque tower, and to have dated from about the year 1588. At the Southwark end were the corn-mills, the Priory and Church of St. Mary Overy, and Winchester Palace.

We trust that the days of great architectural bridges are not yet past, and while the introduction and use of steel has rendered the



Offices of the Public Trustee. (*See page* 12.)



Portion of Parthenaic Frieze: Conjectural Restoration. (*See page* 14.)

By Mr. A. C. Conrade.

combinations possible more difficult to treat architecturally, the use of ferro-concrete in the closing decades of last century may give opportunities of once more reconciling architectural and engineering requirements where the use of masonry bridges is for some reason or other out of the question. But the old bridges of England and the Continent, and the wonderful structures of the Romans, remain to show us what effects of design are possible in bridge building, while the great war of a hundred years ago finds its most fitting commemoration in the magnificent lines and mass of Waterloo Bridge.

The Bridge House Trust, which has had so powerful an influence upon London's development, is one of its oldest institutions. It is to-day a great power, and meets some of the pressing necessities of London which, without its aid, would have had to be met from the rates at the expense of other services.

It originated in the rents of the houses on London Bridge, of which there are records as early as 1122, and when in 1176 Peter of Colechurch built Old London Bridge its revenues became considerable. King John decreed that the rents and profits should go towards the repairs and maintenance of the bridge. Henry III. seized the revenues, but the Corporation regained possession, and in 1281 tolls were instituted. About this time private benefactors began to leave legacies for the Bridge House Trust, and, later, its income was further increased by profits from fisheries and water supply. Some idea of the extent of the income can be derived from the record that in 1358 the number of shops on the bridge was 138, and the total rent £160 4s.—in those days a very considerable sum. From a later record, in 1777, a day's toll was from £9 to £10, and the annual toll about £1,500.

The funds were administered by the Warden, who became a most important personage, and, although at first there were serious deficiencies owing to the rapid decay of the bridge and its bad construction, there was soon a surplus sufficient to enable the Trust to lend money for public objects, which it did from early in the sixteenth century. In Elizabeth's reign a standing committee was appointed with a Bridge Master to preside, and this is the authority to-day. The Committee is elected by the Liveries at midsummer.

The Trust erected Westminster Bridge in 1749 and Blackfriars Bridge in 1760. Southwark Bridge followed, and since then the Tower Bridge has been built. London and Blackfriars Bridges have been widened, and the accumulated riches of the Trust are now to be devoted to the much discussed St. Paul's Bridge.

Sculptured Drum of Column from Temple of Artemis, Ephesus: Conjectural Restoration. (*See page* 14.)

By Mr. A. C. Conrade.

EDINBURGH ARCHITECTURAL ASSOCIATION.

Owing to the fact that the majority of the members are now on military duty, the Associate Section of this Association have had to suspend their syllabus. The senior body, however, arranged their programme for the present session, and amongst other interesting items is included a lecture by Mr. W. T. Oldrieve, F.R.I.B.A., F.S.A.(Scot.), on "A Recent Visit to New Zealand and Some of the South Sea Islands." Several visits have been arranged for, and the annual excursion will be to Perth on Saturday, July 1.

REINFORCED CONCRETE REGULATIONS.

The regulations with respect to the construction of buildings wholly or partly of reinforced concrete and to the use and composition of reinforced concrete in their construction, which were made by the London County Council on July 6, and confirmed on July 13, have been allowed by the Local Government Board, and the Board directed that they should come into operation on January 1. The details of the regulations were published in the *London Gazette* on the 28th ult.

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MEETINGS.

MONDAY, JANUARY 10.

Surveyors' Institution.—Paper by Mr. R. M. Kearns (Fellow) entitled "Notes on Reinforced Concrete." 5 p.m.

Incorporated Clerks of Works' Association (at Carpenters' Hall, London-wall, E.C.).—Lecture by Mr. A. Fincham. 7.45 p.m.

TUESDAY, JANUARY 11.

Institution of Civil Engineers.—Ordinary meeting. 5.30 p.m.

THURSDAY, JANUARY 13.

Society of Architects (at 28, Bedford-square).—Annual general meeting. 5 p.m.

Royal Society of Arts.—Colonel Sir Thomas H. Holdich on "The Romance of Indian Surveys." 4.30 p.m.

CORRESPONDENCE.

The Housing Problem.

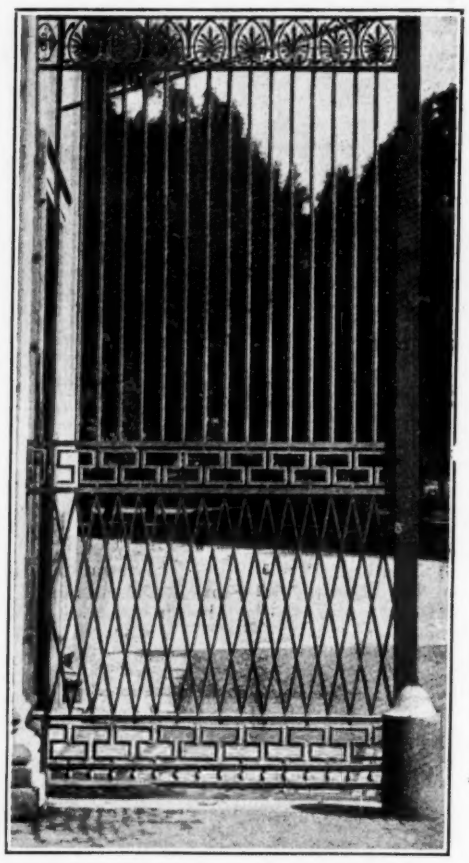
SIR,—Will you permit me to open the new year by inaugurating a discussion in your columns on this important subject?

The normal growth of house building since the Finance Act, 1909, has been interfered with, and most people and all architects and quantity surveyors hope that the speculating builder has been killed without hope of resurrection, and this decay in growth has been emphasised most unwisely since the war. It will, however, have to be faced in the future, and perhaps the new era will be in the direction of erecting extensively garden cities. We should all like to see this enlarged upon. But does this movement really reach the class to be catered for? I suppose everybody agrees that after the war the interest on money will be permanently increased; also the cost of building (along with other commodities) will be raised, not only with wages, but owing to the demand for every class of building material to make good the wastage of war, as well as the decay in the natural growth of buildings since 1909, so that it will be difficult to build a "garden city house," with land, roads, gas, water, and drains, to let at 10s. a week. If a good workman is earning 40s. a week, he is no more justified in living in a house at 10s. a week than another man with £400 a year is in living in a house of £100 rental. But even if he will pay this rent, the man earning 40s. a week need not be looked after. He can save sufficient money to build his own dwelling with the help of his building society. But the casual labourer earning from *nil* to 20s. a week must be housed. It is a duty on citizenship. There are three courses open:—(1) He must pay higher rents to attract capital in preference to investing in War Loans. (2) The Corporation may build; but if Corporations build they should be restricted from letting houses at a rent insufficient to pay interest on the cost, for one must remember that Corporations can borrow money at 2 per cent. less than most private owners, and it is unfairly pauperising people for a Corporation to build houses worth 6s. rent and let them for 4s. They have just as much right to build houses worth £60 rent and let them for £40, and to take the difference from the rates, and legislation should enforce and limit such restrictions as interfering with private trade. Or (3) there must be a drastic alteration in building by-laws, and I think, Sir, that this is the most feasible principle. If you make a survey of the houses in any city or large town which have been built twenty-five or thirty years, these houses are out of date; not only that, but the district is out of date for the class of house. Yet in accordance with the building by-laws these houses are so well built that they will last for another 100 years or more, and it is impossible to ask the owner to scrap them. Still more impossible is it to show him that it is a profitable investment to scrap them and to build something else, as the rent has never been sufficient to pay both interest and a sinking fund. Yet in any other trade they would have been scrapped or remodelled long ago. Then, even if such solidity is necessary, fashions change. Why may I not build a house with rooms 6 ft. 6 in. high if I wish? If I can't let it, I am the loser. If I do let it, it is because someone else wants it.

No doubt there will be wastage during the war, but in every previous European War refugees have come to England; many have remained, and have partly made good the casualties and taught us new trades. Everyone wishes the wage-earner to be comfortably housed in a decent dry house (wherever practicable with a bath), but unless he will pay a much higher rent or induce the actual builder to continue the good lesson taught to the munition worker, of doubling his output, it resolves itself either into Corporations building all houses at the cost of the ratepayers, or reducing radically their building restrictions, and, to quote Mr. Nettlefold's seasonable words, "that local authorities should be content and wisely content to encourage others to build houses."

W. H. WOOD.

Leeds.



Old Italian Ironwork: Gateway, Villa Umberta, Rome. (*See page* 11.)

BOOK RECEIVED.

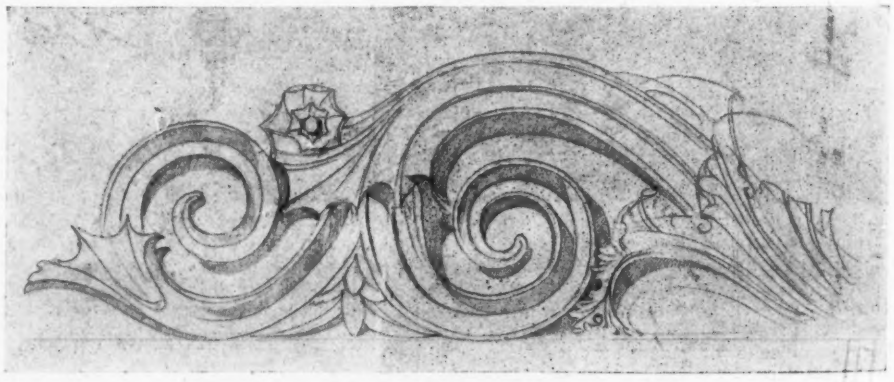
GOTHIC ARCHITECTURE. By T. G. Jackson. Two volumes. (Cambridge University Press. £2 12s. 6d. net.)

FIFTY YEARS AGO.

Railway Matters.

THE new Farringdon Station of the Metropolitan Railway and the extension line to Finsbury have been opened for traffic. The time occupied in running between Finsbury and the Great Western Railway at Bishop's-road is twenty-two minutes, calling at all the intermediate stations. There are to be four lines of rails on the extension line, two for the Metropolitan line proper, over which the trains now run, and which will be continued to Trinity-square, and there, by a junction with the District Metropolitan line, form a portion of the "Inner Circle" line on the narrow gauge. The other two lines are on the mixed gauge for the accommodation of the Great Western, Great Northern, and Midland Companies' traffic; but the mixed gauge lines are not carried further at present than Aldersgate Station.

[*** We give the above extract from the *Builder* of January 6, 1866.—ED.]



Detail from Choragic Monument of Lysicrates.

Drawn by Mr. A. C. Conrade. (*See page* 14.)

FAMOUS CHURCHES OF RUSSIA:

BLAGOVIESHCHENSKI SOBOR IN THE KREML', MOSCOW.

MILLIONS annually flock to Paris, to Rome, and other famous cities of the Continent, but in the past not many have thought it worth their while to pay a visit to the historic towns of Russia. Truly Russia has been neglected. This state of things, however, will pass, and pass quickly. Russia and Britain, having joined hands in the titanic task of upholding the cause of a common humanity, are friends as never before. It is the first step. After this will follow conducted tours and enhanced facilities of communication. Russia will become the fashion and Petrograd popular. But of all the towns in Russia it is safe to say none will claim more interest than Moscow, the famous capital of mediæval Russia.

The almost complete isolation of Russia during the period extending from the fourteenth to the eighteenth century provides the cause of its development along such seemingly narrow yet characteristic lines. Throughout that period, so important in the evolution of modern Russian history, the town of Moscow was the very centre of its existence. She was "Our little Mother Moscow," and only by those who understand the Russian temperament and know how endearing and expressive the language may be made can the full force of such a title be appreciated. To her, as a child to its mother, the people turned in times of trouble and affliction, and at all times for guidance in spiritual things. She was the Mecca of their faith, the favoured dwelling-place of their rulers.

It is true that when St. Petersburg was founded, in the early years of the eighteenth century, Moscow lost her temporal pre-eminence. Peter the Great practically forced the whole fashionable world—the Court and nobility—to take up its abode in his new capital on the banks of the Neva. Moscow henceforth was left behind, and happily left behind, in that stern struggle for progress along Western lines which was inaugurated by the shipwright Tsar. But Moscow has never lost her place in the nation's affections, nor will she ever. Whatever happens, she will never cease to be Holy Moscow, the "Little Mother." She is the most Russian town in Russia, the centre of religious life to the most religious people in the world.

The recollection of her past historic *rôle* has something to do with this; but also there is the underlying feeling that she is representative, as is no other town, of all that is revered in Russian national life.

What Moscow has been to Russia the Kreml' has ever been to Moscow—the centre of its life and interest. For within its ancient walls is the Grand Palace of the Tsars and the Uspenski Sobor (the Cathedral of the Assumption), wherein the Tsars assume the Crown. Moreover, within this ancient citadel on every hand are buildings which recall the glories of its storied past. Most noteworthy perhaps of these are the "Spass na Borou" (Our Saviour in the Wood), the most ancient church in Moscow, and two other cathedrals besides the Uspenski. One of these, dedicated to the Archangel Michael, is the national Valhalla where are buried the Grand-Dukes and Tsars from the time of Ivan "Kalita" (Money-bags) (1341), to Féodor Alexievich (1682), with one exception. The other is the Cathedral of the Annunciation, whose history we are at present to consider.

Of the cathedrals, Blagovieshchenski Sobor is perhaps the most interesting from an architectural point of view. All three stand grouped around the great tower of Ivan Veliki on the Sobornaya Ploshchad—the Cathedral Place—close by the Grand Palace. But the Cathedral of the Annunciation, owing perhaps to the fact that it was nearest to the old palace, the remnants of which still exist incorporated in the fabric of the Terem, was the "Chapel Royal," so to speak. At its font the children of the Royal House were baptized. At the Holy Door before its altar the Tsars were wedded, and within its precincts approached the other sacraments of the Russian Orthodox Church. In fact this cathedral was for five centuries the scene of most semi-State ceremonies in which the Grand-Dukes and Tsars took part.

Although less favoured in some respects than the Uspenski or Archangelski Cathedrals, it is externally of more pleasing aspect and design. Being smaller than either, and less in altitude even than the grandiose modern palace behind it, it appears all the more picturesquely compact in consequence. Its general appearance as seen from the north-east may be gathered from the illustration. It will be observed that it is typically Russian in its general appearance, and is perhaps as good an example as any to be found of this distinctive type. Almost entirely neglected in our text-books and in our schools, there is yet a fund of instruction and interest to be gleaned from the study of this curious type—an admixture of Tatar and Byzantine art.

The remotest date to which we can go back in the history of Blagovieshchenski Sobor is 1291, when a wooden church was erected on this spot, the highest within the Kreml', by Andrew, son of Alexander Nevski, Prince of Novgorod. The foundation of a new church by Vasili Dmitrievich is recorded in 1393, while eleven years later (1404) we are told in the Annals "commenced the subscription for the Church of the Annunciation on the Grand-dukal Court." The walls of this early church were painted in fresco by Andrei Rublev, a Greek Theofan, and a monk Prokhor.

Ivan III., soon after throwing off the Tatar yoke (to which the Russians had been subject for two hundred and forty years and from which they were released in 1480), proposed to erect a new church. Hence, in the summer of 1482, as attested in the Annals, "began to be demolished the church on the Square of the Annunciation, the upper part being pulled down." Thus it would seem evident that the ground floor was left for a time. The annalist mentions particularly that this ground floor was left "for keeping the treasury"—that is all those precious objects and treasures belonging to the church, and also the Sovereign's personal property. The popular name of the "Church of the Tsarian Treasure," by which it was sometimes designated, arose from this custom of storing beneath the churches valuable objects. In those days Russians of wealth were well advised in thus consigning their valuables to the protecting care of the Church. They were for the most part lawless times, and men thought little enough of theft from their neighbour. But theft from the Church was quite another matter. Larceny may have been prevalent, but even the thief would not commit the sin of sacrilege in Russia.

It is noticeable that most references (in guide-books and the like) to the demolishing of this early church speak as if it was a stone church which had been pulled down. By inference they seem to suggest that the original ground floor still remains. But it is altogether more probable that it was of wood, for the annalist goes on to speak of the foundation of a stone church of the Annunciation in the spring of 1484 and of its consecration in 1489. This is substantially the church that yet stands. Architects and craftsmen were procured from the neighbouring principality of Pskov to undertake the work as being more skilful in stonework than the Muscovites.

In the year 1547 it was seriously damaged in the great conflagration which destroyed nearly the whole of Moscow. We are told that such was the intensity of the flames that liquid metal ran along the streets. In all about 1,700 adult "souls" lost their lives. In the Church of the Annunciation, as in many another church, many precious icons were destroyed and the whole edifice threatened.

Ivan IV. (the Terrible) repaired the damage, securing for the purpose the Milanese architect, Aloisio da Carezano, who was then at work in Moscow. He reconstructed the gallery and, in addition, built the four chapels above, adorning the interior of the church with painted icons from Novgorod, Pskov, and other places. He is said, too, to have covered the cupolas with plates of gold, the metal for the purpose having also come from Novgorod. From which it may be gathered that this Tsar, Ivan "Grosnagho," although he fully deserved the name, yet had spasmodic interludes of piety, and was thoroughly Russian in his devotion to the Orthodox Church. There are indeed few churches dating from before his time in Moscow that do not owe some embellishment or renovation to him.

By these additions the outward appearance of the cathedral was much improved, not only by the new chapels with their four additional cupolas, but also by the Renaissance arcading of the gallery. The latter had hitherto been either an open passage-way or perhaps covered in with a superstructure of wood.

Throughout the sixteenth century the Annunciation continued to be the Court church, and it was so until the time of the first Tsar of the Romanov dynasty (Mikhail Féodorovich, 1613–1645). It was this monarch who bestowed upon it the full title of "The Cathedral Church of the Annunciation of the Most Holy Virgin." It was he, too, who had an approach constructed uniting the church with the Royal apartments of the old palace. This improvement, by means of which the Royal Family could pass directly and unobserved from the palace to the choir of the church, was probably included in the restoration which followed the sack of the church by the Poles in 1610.

The Poles occupied the town and put the inhabitants to the sword. It was a time of anarchy following upon the death of Boris Godunov—it was the break between the dynasty of the Ruriks and the Romanovs. The restoration of peace followed, and the election of Tsar Mikhail, to a great extent owing to the efforts of a butcher of Nizhni-Novgorod. He made an eloquent appeal to the people and moved them to something like concerted action. Under the leadership of Prince Pozharski they besieged the town, which eventually fell to them in 1612.

Just two hundred years later the cathedral again suffered considerably. The French invasion of 1812 spared none of the edifices in the Kreml', and the rest of the town was burned by the Russians themselves. The Royal Palace was reduced to ruins, and horses were stabled in the cathedrals. In the words of an officer in the French Army who was there present, "Moscou en grande partie n'offrait plus à nos yeux qu'un amas de ruines."

The cathedral was restored by Nicholas I., and in the reign of the succeeding Tsar, Alexander Nikolaevich, the nine cupolas were re-covered with gilded bronze plates.

In surveying its architectural features we must bear in mind that the long basilican form, so familiar to us in the West, is seldom if ever adopted in Russian churches. In their plan they deviate but little from the square, and are generally small. Blagovieshchenski Sobor is no exception to this rule. It is indeed bijou, and in plan is only slightly oblong.

Its ogive roofing, the novel appearance of which is noticeable in the illustration of the north façade, is typically Muscovite. In the drawing the peculiar setting of the central ridge of the lower range of gables will be noticed. This feature, which also occurs on the south side, is necessitated by the structural features

of the interior. The peculiarity would not, of course, be observable from the ground.

But the dominant exterior characteristic of Russian ecclesiastical architecture is undoubtedly the pear-shaped cupola. In some instances the bulbous dome issues from a tapering roof or spire, but is then less pleasing than when, as in the present case, the dome is superimposed upon an elegant slender drum rising from low-pitched vaulting. In this case there are nine cupolas; mostly, if more than one there are five. But the mere number is immaterial, the important point being that they should accentuate the importance of the great central dome.

Introduced into Russian architecture by the Tatars and ever since adhered to by the Russians, this form of dome is purely Asiatic. It is the one trait which, strangely enough, raises the native church architecture from being merely a phase of debased Byzantinism into something noble and distinguished.

Each cupola is surmounted by an imposing openwork cross, supported by chains which depend from each arm to the bulb. At the foot of each cross there is a crescent. This combination is of frequent occurrence on Russian churches, and by some writers it has been said to be a relic of the Tatar occupation. The Tatars, they say, changed the churches into mosques and placed the Moslem crescent above them, and when Ivan Vasilievich drove them out he restored the crosses, but left the crescents to symbolise the triumph of the Cross over the Crescent. This may be considered rather as a clever fiction than as the fact. The most satisfactory and most probable explanation is that it is allegorical of the Saviour (Lord of Earth) issuing from the Blessed Virgin (Queen of Heaven). Such a symbol, expressing as it does vital and familiar principles of the Orthodox faith, would appeal most strongly to the minds of the faithful.

The great cross on the central dome is of gold, and by good fortune escaped destruction by the French in 1812. It was known that one of the edifices in the Kreml' was surmounted by a cross of gold, and the looters, seeing the great gilded cross on the tower of Ivan Veliki near by, thought that must be it. They pulled it down, doing much damage to the top of the tower, but were disgusted to find when they examined the cross that it was only gilded wood. Meanwhile, if they had but known it, the real gold cross was just across the square—where it is to-day in fact—on the central dome of Blagovieshchenski Sobor.

The exterior work of the five ancient drums, and of the apsidal termination—the arcaded cornice with slender pilasters resting on corbels—strongly resembles much of the early work upon the churches of Vladimir, Suzdal, Novgorod, and other districts. Already in the twelfth century it was an established feature of Russian architecture; and even that early it had developed considerable ornateness of detail, as witness the quaintly decorated "fringe" round the diminutive Dmitrievski Sobor at Vladimir.

The chief apartment, the church proper, is raised above the street level 5½ *arsheen* (12 ft. 10 in.). It is approached by a fine covered gallery which flanks the church on three sides. Below is the crypt, a series of vaults extending beneath the galleries and the nave, but yet on the street level, and appearing on the south façade as a deep ornamental socle or plinth to the whole superstructure. This device of raising the floor of the church and surrounding it with a gallery is one which is frequently found in Russian churches, and is appropriate to the climatic conditions of the long Russian winter. It secures the edifice with its costly decorations and precious contents from destruction by damp and cold. On the other hand, in the heat of summer the surrounding gallery gives a welcome coolness to the interior nave. The vaults are reached by steps from the south-west corner of the gallery.

Access to the gallery is gained at the north-east porch by a flight of broad steps from the Sobornaya Ploshchad. Exteriorly it appears as an arcade of semicircular arches resting on ornamental pilasters, the whole giving unmistakable evidence of the influence of the Western Renaissance. This tendency is noticeable in all of the work of the period of Ivan "Grosnagho," although here and there one finds the more barbaric tone of Tatar influences.

The interior walls of the gallery and the whole of the low-arched cross-vaulting are covered with frescoes and elegant mural decoration. These paintings have undergone so many restorations that it is unlikely that much of the original work is left. Their exact age, therefore, is problematic. They are attributed by one well-known guide-book to the year 1508. This, of course, is out of the question, as the present gallery was not built until after the fire of 1547. Another writer states that they were painted in the year of the great plague, 1771. What is most likely is that at its completion the gallery was decorated, at least in part, and the pictures subsequently restored or replaced at the dictates of the Imperial taste. For instance, in 1621, Tsar Mikhail Féodorovich "commanded to be painted the arches and walls uncovered at the side-wing of the church" (somewhere towards and near the north-eastern stairway). Again, by order of Tsar Alexis Mikhailovich, the porch and stairs were painted (probably restored) by the icon-painter, Ivan Filatev.

Seen in the diffused light they have no doubt a strong devotional effect upon the deeply religious Russian mind. But quite apart from this they are of much interest to all students of the Byzantine tradition. The subjects are mostly of sacred import, but there is a most interesting series of portraits of ancient philosophers and historians, which are said to have been originally executed in the sixteenth century by the Russian artist, Féodor Edikeeff. Socrates, Plato, Menander, Anacharsis, Zeno, Ptolemy, Plutarch, Thucidides, and others are represented, each supporting a cartouche upon which is inscribed an extract from their works. On the eastern wall of the gallery, over the entrance, is a great painting of the Saviour, popularly supposed to have a supernatural origin. "Not made by human hands" is the way the faithful put it. One cannot help wondering how in such a case they ever allowed one Simon Ushakov to restore it in 1661. He may have been a celebrated icon-painter in his day, but it seems bordering on the disrespectful.

Two doors lead from the gallery into the nave of the church, one on the north side and one on the west. The southern wing of the gallery is now, and has been for many years, partitioned off. At one time access was possible by the stairway at the south-eastern porch, which forms so striking a feature when the church is viewed from beyond the railings which enclose the Sobornaya Ploshchad. This entrance, now disused, is traditionally mentioned as having been built by Ivan for his own convenience in going to church. It would certainly prove a short cut to the niche which he usually occupied during the services and which is still shown, by the south-western pier, opposite the Royal door of the Iconostas. The Tsar's throne now stands in front of this niche. Again, this south-eastern entrance is mentioned as being the spot from whence were published the banns of this Tsar's fourth marriage. This marriage was against the Canon law of the Greek Church, but he forced the prelates to confirm it and also to endorse without protest his frequent divorces—his fifth, sixth, and seventh marriages.

This portion of the gallery was subsequently set apart as a convenient place for the Tsars to rest after the services, and the porch became the usual place for the disbursement of the Imperial charity. The eastern portion is now occupied by the chapel of St. Nicholas, founded by Nikolai I. about the year 1835.

The portals of the doors leading into the church are worthy of more than passing notice. They are without a doubt one of its most interesting decorative features. The two are almost identical in their elegant Renaissance scroll-work carved in relief. Their delicacy of execution establishes their sculptor in the front rank of artists in stonework. They have been said to be native work, but they are usually, and I think correctly, attributed to the Milanese Aloisio. This artist was one of many craftsmen and master-builders whom the Grand-Duke Ivan III. invited to Moscow at the end of the fifteenth century. He did much good work in Moscow at that date, and was occupied in rebuilding the wing of the old palace behind the cathedral from 1499 until 1508. Some of the doorways still existing in the Terem Palace are also attributed to him. They show a similar delicacy of feeling, and are no doubt attributable to the same hand. They date, of course, from the early years of the sixteenth century.

It is impossible in mere black and white to give an adequate idea of their workmanship. But in the accompanying detail drawing one may at least get a hint of their design. Imagine a ground of cerulean blue, with rich relief heavily laid with gold and set with precious stones, surrounding massive red-copper doors, decorated with figured panels, and surrounded by frescoed walls. Truly the Russian loves to adorn the House of God.

The interior is no less worthy of study. In the midst of the church are set the four square piers which support upon a lofty four-arched vault the great drum of the central cupola. The vaulting is thus divided into nine bays. From the four corner bays are raised on similar elegant drums the four cupolas of next importance. The two more easterly ones, beyond the Iconostas, are visible from below, but the westerly pair are screened from view by intermediate vaulting.

The whole of the interior, including the pillars and the vaulting (which is invariably unrelieved by ribs), is decorated with mural paintings of varying merit. These frescoes comprise representations of Christ and His Saints, the Visions of the Apocalypse, the Supplication of the Damned, and the Glorification and Reward of the Saved. Their actual age is doubtful. Fabricius, in his work "Le Kremlin," 1883, states that they were first painted in 1482. This is clearly a mistake, as the present building was not started until 1484, and was not finished until 1489. That they may be fairly ancient is shown by the fact that they are mentioned in early inventories of the church. Moreover, early in the sixteenth century (in 1508), by order of the Grand-Duke Vasili Ivanovich, it was decorated in fresco—at any rate in part—by the monk Theodocie Deonicev. It may be that he only restored others, for the Annals at this time record: "Ordered . . . (the church) . . . to be signed by gold," and "commanded also . . . the upper part of the church to be covered and gilded." We must bear in mind, too, the great fire which in 1547 devastated the church and without a doubt necessitated the renovation of the whole interior. Subsequent restorations were carried out by Peter the Great in 1697, and by Catherine II. in 1770; there is a tablet on the south-eastern pillar to this effect. Again it was restored in 1835 by Nickolai I.

One may surmise that some of these "restorations" were entirely new work, for in 1882, while occupied in renovating the paintings then occupying the walls, the architect Schokhin and the painter Fartussov discovered that there were more ancient paintings beneath. They reported their discovery to the Emperor, and a Committee was formed to supervise their preservation. This Committee was composed of an archæologist, Zabel, an architect, Rozanov, and a painter, Botkin. The more recent paintings were removed and those beneath once more restored. With such a record one may reasonably doubt if any vestige of the original work is now extant. Like the celebrated stockings of Sir John Cutler, immortalised by Martinus Scriblerus, they have been so often mended that we cannot distinguish any part of the original materials.

As is the case in the parent Greek Church, so with its Russian offshoot, orientation is strictly observed.

The altar is placed in the centre of the triple apse, and in front of it is the elaborate Iconostas which crosses the nave at the easterly pair of piers. Entirely dominating the interior by its wealth of decoration and its display of sacred pictures, the Iconostas is still fine. But anciently the bands and columns of bronze which divide it into five tiers of icons were encrusted with gold and silver and enamel work. It was necessary to restore it entirely after the pillage of 1812.

In the centre is the Royal door of massive silver, and to the right of it is a fine example of Byzantine art, a painting of the Saviour, which is said to date from 1337. Another picture on this side worthy of special note is of the Annunciation. It is of Greek origin and is surrounded by a rich and costly frame. On every Iconostas the Saviour is depicted on the right next to the Holy Door and next to that is always placed the "titular picture," as it might be called, of the patronage of the church in question.

But the most celebrated of all the icons in Blagovieshchenski Sobor is undoubtedly the Virgin, which is on the left of the door. This is the Donskoi Virgin, the "Virgin of the Don," and is a much revered icon of fourteenth-century date, in a frame of pure gold. The frame still shows signs of the damage caused by French hammers. In their search for all that was worth taking they mistook this frame for mere copper-gilt, and so left it. That it was thus passed over is, of course, popularly attributed to miraculous agency. But this is only a later addition to its fame. It obtains its name from the Grand-Duke Dmitri Donskoi, who carried it affixed to his standard at the battle of Kulikovsko, in 1380. Here is what the Chronicles of Novgorod tell us of this battle:—

"And having heard this, that a great Tatar force was coming against him, the Veliki Knyaz Dmitri Ivanovich gathered many soldiers and went against the godless Tatar, trusting in the mercy of God and in His Immaculate Mother, the Mother of God, the eternal Virgin Mary, calling to his aid the honourable Cross. For he entered their country beyond the Don and there was there a clean [*i.e.*, treeless] field, at the mouth of the River Nepryadva, and there the pagan Ishmælites had ranged themselves against the Christians."

They were at first fearful and inclined to run away, but they were rallied.

"And the Veliki Knyaz Dmitri with his brother Volodmir ranged their troops against the pagan Polovets people, and raising their eyes humbly to Heaven, and sighing from the depths of their hearts, said, in the words of the Psalm: 'Brothers, God is our Refuge and our Strength,' and both forces immediately met and there was a fierce battle for a long time, and God terrified the sons of Hagar with an invisible might, and they turned their shoulders to wounds [*i.e.*, fled] and they were routed by the Christians. And some were struck down with weapons and others were drowned in the river, a countless number of them."

And all this happened on September 8, 1380, "a Saturday, the day of the birth of the Mother of God."

Again the picture was taken into the battle line in 1591 by Boris Godunov, whose victory over the Tatar Kazi-Hirey-Khan was attributed to its agency.

It has ever been the custom with the Russian Army to take with them into the field of battle their beloved icons. As recently as 1904 General Kuropatkin, before starting for Manchuria, received from the hands of the Abbot of the St. Sergius monastery a holy icon. Moreover, at the outbreak of the world-war in 1914 each regiment of their modern scientifically-equipped army marched to the front with its holy banner at its head.

The Donskoi Virgin is more attractive in its treatment than most icons of the Virgin, a fact probably attributable to its Græco-Italian origin. The Mother and the Divine Infant, usually so stiffly and formally treated, are here almost human in attitude, cheek to cheek. Another picture, the Assumption of the Virgin, is depicted on the back.

Most of the other pictures on the Iconostas are modern, including the eighteen medallion heads of saints by eighteenth-century Flemish artists which surround the Donskoi icon.

Another fine old icon is within the sanctuary. It is a Virgin and Child of somewhat more formal treatment than the "Don," and is known by the name of Barlovskoi, or "The Most Holy Womb." Originally of fourteenth-century date, it was restored by Simon Ushakov, probably in 1661, when he restored the great painting of the Saviour in the gallery.

The floor of the cathedral, a present to Tsar Alexis from the Shah of Persia, is a fine example of mosaic work in jasper and agate. It is said to resemble a portion of the pavement in St. Mark's, Venice.

On the level of the nave it only remains to speak of the sacristy. Near to the cathedral, at the south-east corner, there existed until the seventeenth century a small chapel of St. Vasili the Emperor, founded in 1489. It was found to be too near to the south apse, and in 1654 it was closed and demolished. The sacristy now occupies the site. The Iconostas of the old chapel was preserved and now adorns the modern chapel of St. George above.

Over the west end of the nave is the choir, a gallery which in times past was usually occupied by the Tsarina and Tsarevna during mass and the other services. The Tsar himself always sat below in front of the Iconostas, facing the Holy Door. The throne of State is still in its place, and near it is an alcove in which, as before mentioned, Ivan "Grosnagho" usually attended the services. I say the Tsar sat below, but the Russian always prays standing, hence there are no seats in the churches in Russia.

The staircase to the choir and thence to the four chapels (which are quite separate from the church and from each other) is at the north-west angle of the nave. From the choir a door (again in Renaissance style, though not so elaborate as those below) leads out upon the roof of the gallery and thence descending by a few steps connects by a short bridge with the Palace.

By way of the roof, to the right and left, the two westerly chapels are gained. Beyond each of these, by the archways between the wall of the church and the chapels, those at the north-east and south-east are reached. This arrangement, by which the four isolated chapels are accessible only by doorways from the roof of the gallery, must strike the western mind as being curious in the extreme. One encounters many such curiosities in Russian architecture, a truly glaring instance being the monstrosity, rather than church, of Vasili Blagennoi on the Krassnaya Ploshchad. This is really a collection of separate little churches or chapels connected by passages and united under one roof.

Architecturally there is little calling for remark in the chapels. Their exterior appearance is quiet, although rather commonplace. Their severe panelling and other detail is purely Renaissance, although at the same time it is not so obtrusively evident as to make the crowning of each chapel by its ogive gables and pear-shaped cupola anomalous. The four drums are more plain than those of the older part of the church. There is no pilastered cornice such as stamps the older work with its Vladimir-Suzdal feeling.

Interiorly the roof of each chapel is composed of four vaults. The two greater rest upon the north and south walls, while the smaller pair spring east and west, joining them and forming in the centre a four-arched vault upon which is raised the drum and cupola.

The north-west chapel is known as "The Church of the Most Holy Virgin." It has what is perhaps the most ancient Iconostas in Moscow. Upon this are icons of the Annunciation and the Four Evangelists, the Lord God of Hosts, and the Last Supper. These venerable pictures are richly decorated with silver repoussé and precious gems. At the north-east is the "Church of the Archangel Gabriel," the Iconostas, furniture, etc., of which date from the time of Tsar Mikhail Féodorovich (1613–1645), and were a gift from him. The chapel at the south-west corner commemorates the "Entry of Christ into Jerusalem," sometimes called "The Jerusalem Gate." The Iconostas here again was a gift from Tsar Mikhail, and dates from 1614. The remaining chapel, which is dedicated to St. George, was rebuilt during the reign of Alexander Pavlovich. This monarch also changed its name, dedicating it to the sainted national hero, Alexander Nevski, but it is now again known by its more ancient name. The only outstanding feature is its fine old Iconostas. This, as has been mentioned earlier, was removed from the chapel of St. Vasili at its demolition in 1654.

The chapels, by some strange chance, entirely escaped the depredations of Napoleon's army in 1812. Perhaps they could not discover the way to reach them. Hence the fine gold and silver work and the precious stones which deck the Iconostases and the other church furniture of value were left untouched.

The precious treasures and relics of the sacristy were removed at that eventful time to Vologda, and so escaped likewise. Among the more remarkable of these may be mentioned (1) a reliquary containing the sponge used at the Crucifixion; (2) two copies of the Gospels presented by Ivan Vasilievich, one in 1568, the other in 1571 (both are adorned with silver, gold, and many precious stones); (3) a chalice of agate given to the church in 1328 by the Archpriest Moise; (4) two portions of the True Cross cased in gold, one adorned with pearls and various precious stones, the other enamelled; (5) the Panagia (a cross worn suspended round the neck by bishops) of Theofan, patriarch of Jerusalem (this relic is formed of stone from the sepulchre of Christ); (6) an image (cruciform) enclosing another relic of our Lord's Passion, decorated with figures in black enamel. (This precious object—a spike from the Crown of Thorns—was brought from Tsargrad (Constantinople) to Suzdal in 1383 by the Archpriest Deonicev, and thence at a later date to Moscow.)

This is but a brief review of this interesting little cathedral. In some way or another all Russian churches are of interest, for no two are alike. But over some more than over others there spreads that national tone, that spirit which is part of the Russian individuality. Situated as she is between Western civilisation on the one hand and Oriental barbarism on the other, Russia has absorbed something of the spirit of each. Hence, although she received her earliest inspirations towards ecclesiastical architecture from Byzantine sources, yet the Asiatic influence of the Tatars has left its mark. If we add to this the strong uplift which in the late fifteenth century was given to Russian architecture by the Milanese craftsmen of the Court of Ivan III., we have as a product the unfamiliar but expressive type so well exampled in Blagovieshchenski Sobor.

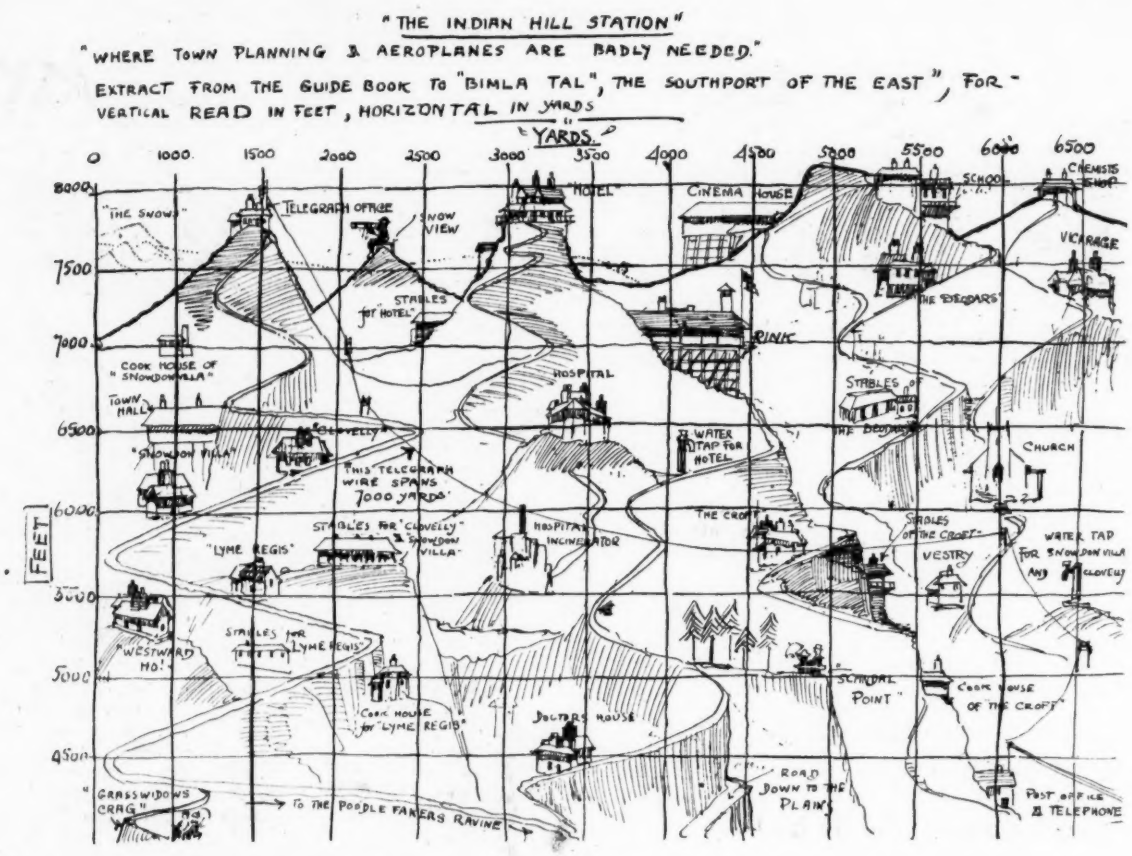
CYRIL G. E. BUNT.

BOOK REVIEW.

Experimental Physics. By HAROLD A. WILSON M.A., D.Sc., F.R.S. (Cambridge University Press. 8½ in. by 5½ in. 405 pp.)

THE author's aim as set out in his Preface is to deal thoroughly with fundamental physical phenomena without attempting to be exhaustive in the field which he includes in his survey, and though, as he states, much originality is not possible in the treatment of the branches he selects—mechanics, heat, sound, and light—his work shows an individuality which justifies yet another text-book on these subjects.

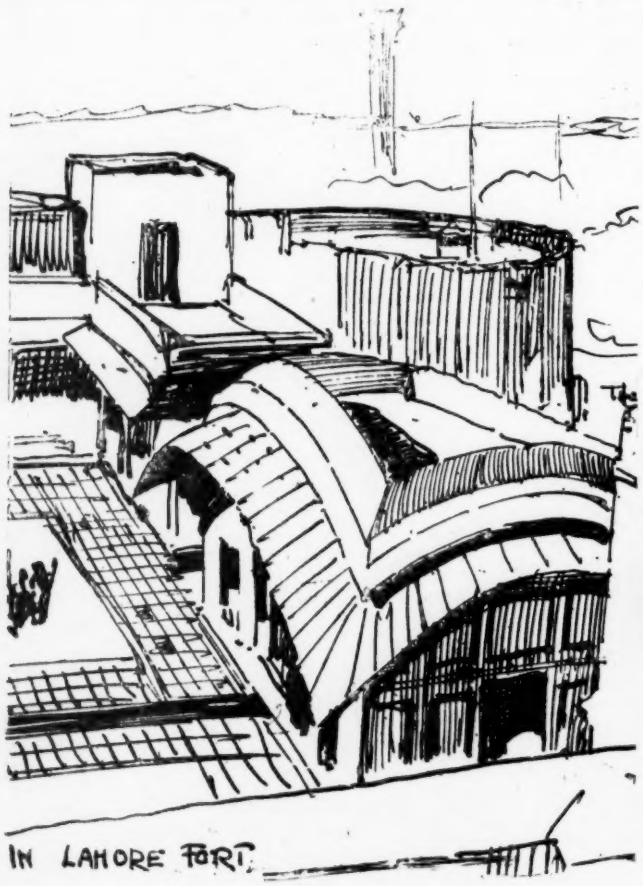
Though we are told that no previous knowledge of physics is assumed, we imagine that some mental sympathy with natural science is expected by those who use this book, and a general knowledge of elementary algebra and trigonometry is assumed by the author for its study. The first hundred odd pages are devoted to mechanics, in which section the experimental method for investigating the force acting on a body moving in a circle may be cited as an example of clear exposition and good diagrammatic illustration. Rather less space is devoted to heat and also to sound, in which latter section the chapters on wave motion and wave trains are worthy of comment, and are more advanced than much of the other matter. The last hundred pages deal with light. The book seems well suited for students beginning a college course or for schoolboys with good mathematical attainments who desire to obtain a useful acquaintance with physics. Published as one of the Cambridge Physical Series, the work is well printed and the illustrations are particularly clear and practical.



SKETCHES BY THE LATE GORDON SANDERSON.

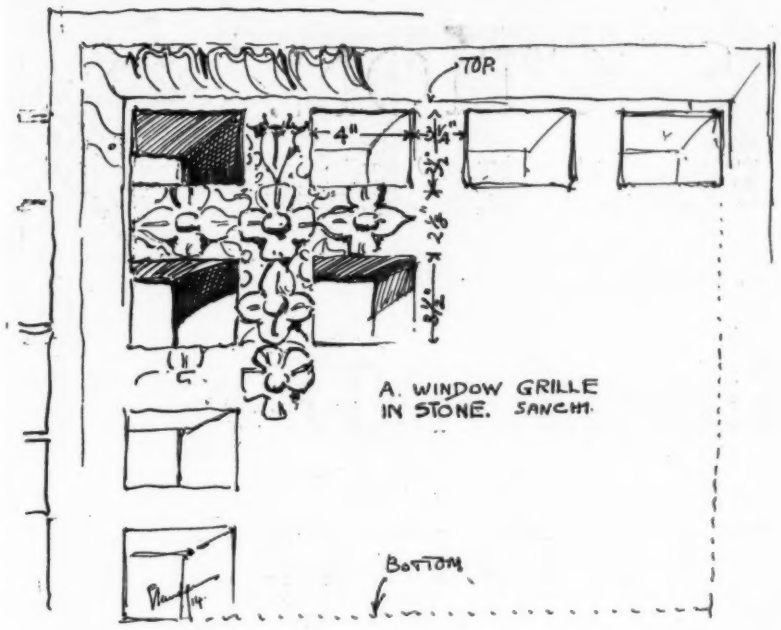
THE accompanying series of sketches form a selection from a number collected at various times during Eastern voyages, and, although only hasty impressions collected here and there, preserve memories of pleasant places visited and serve as "*technica memoria*." One shows the late Mr. Sanderson's impression of an Indian hill station, fitly described by a well-known architect as a place "where God made the hills and the monkeys built the houses."

The details from Sanchi, India, illustrate the Grecian character of the ornament found on the early Buddhist structures; while the artist attempted, in another, to reconstruct a portion of a walled Buddhist city from the carvings found on the Sanchi gateways. The illustration of the "Golden Temple," Amritsar, illustrates the jumble of styles so often found in Eastern cities where matters of architectural moment are left to the tender mercies of the local civilian, with the result that Gothic clock towers take their place side by side with the best Oriental structures.



The "Golden Temple," Amritsar, India.

Sketches by the late Gordon Sanderson.

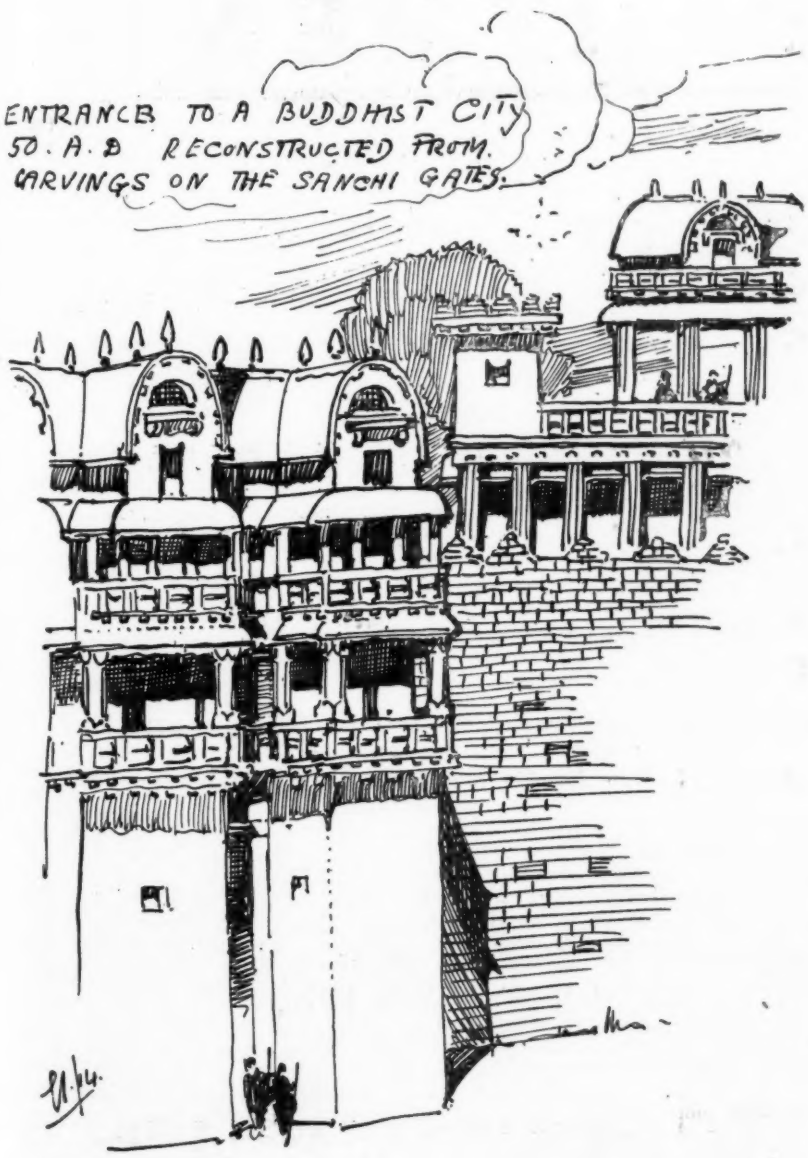


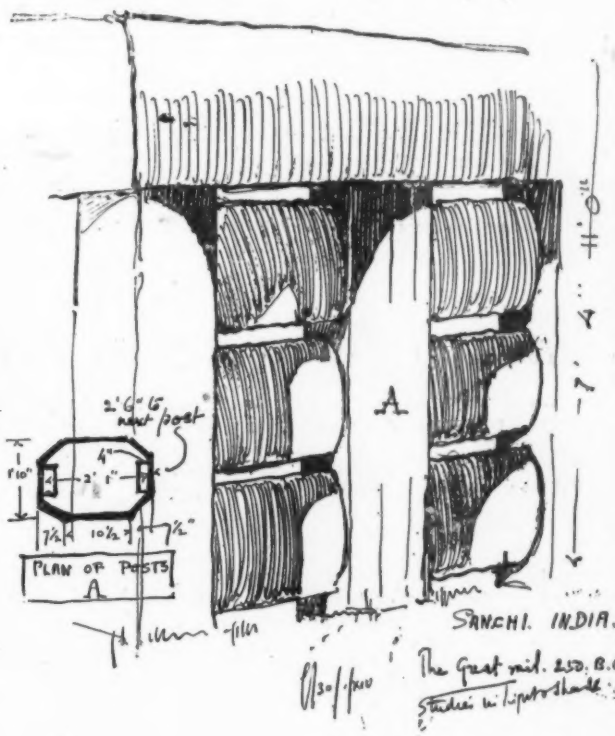
A. WINDOW GRILLE IN STONE. SANCHI.

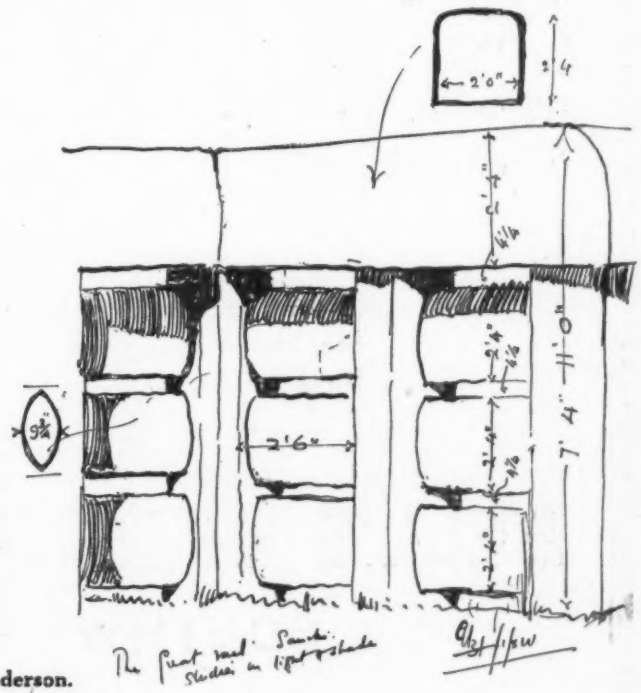
UNFINISHED ORNAMENT ON COLUMNS OF PILLARED HALL

CAPITAL AT SANCHI

ENTRANCE TO A BUDDHIST CITY 50. A.D RECONSTRUCTED FROM CARVINGS ON THE SANCHI GATES.







Sketches by the late Gordon Sanderson.

LEGAL SECTION.

NOTES ON CURRENT CASES.

Myers *v.* Bradford Corporation: Public Authorities Protection Act.

BY sect. 264 of the Public Health Act, 1875, it was enacted that:—"A writ or process shall not be sued out against or served on any local authority, or any member thereof, or any officer of a local authority, or person acting in his aid, for anything done or intended to be done or omitted to be done under the provisions of this Act, until the expiration of one month after notice in writing has been served on such local authority, member, officer, or person, clearly stating the cause of action, and the name and place of abode of the intended plaintiff, and of his attorney or agent in the cause; and on the trial of any such action the plaintiff shall not be permitted to go into evidence of any cause of action which is not stated in the notice so served; and unless such notice is proved the jury shall find for the defendant. Every such action shall be commenced within six months next after the accruing of the cause of action, and not afterwards, and shall be tried in the county or place where the cause of action occurred, and not elsewhere."

The above section was repealed by the Public Authorities Protection Act, 1893, and notices of action, so far as public authorities are concerned, were done away except in such cases as such notice may be required by special or private Acts of Parliament. By sect. 1 of this Act the time limit for bringing actions against public authorities and persons acting in pursuance of a public duty was altered from "six months next after the accruing of the cause of action" into "where any action, prosecution, or other proceeding is commenced in the United Kingdom against any person for any act done in pursuance or execution or intended execution of any Act of Parliament, or of any public duty or authority, or in respect of any alleged neglect or default in the execution of any such act, duty, or authority . . . the action, prosecution, or proceeding shall not lie or be instituted unless it is commenced within six months next after the act, neglect, or default complained of, or, in case of a continuance of injury or damage, within six months next after the ceasing thereof."

A series of decisions has established the position that, although the text of the Act only refers to a "person," yet this word includes "public authorities" (which words are only found in the title of the Act) in so far as they are acting in pursuance of a public duty or authority or in the execution of any Act of Parliament.

In the recent case of Myers *v.* the Bradford Corporation the House of Lords has upheld the decision of the Court of Appeal that the protection of the Act does not extend to private contracts into which a public authority enters, although such contracts may be undertaken under powers conferred upon the authority by an Act of Parliament.

The facts were that under a private Act of Parliament the Bradford Corporation were empowered to make gas and sell coke. They sold some coke to a private person, and in delivering it their carter tipped part of it through a shop window instead of down the coal-hole. In an action in the County Court for damages caused by the negligence of the authority through their carter the jury found for the plaintiff, but the County Court judge entered judgment for the defendants on the ground that the action was not commenced within six months of the act complained of, holding that the defendants were protected by sect. 1 (*a*) of the Public Authorities Protection Act, 1893.

On appeal to the Divisional Court Mr. Justice Lush held that where a public authority acting within their statutory powers had undertaken obligations towards a particular individual, and in the course of discharging them they or their servants were negligent, it was not a case in which they were acting directly in pursuance or in execution of any Act of Parliament or of any public duty or authority, and consequently the defendants were not protected by the Act.

Mr. Justice Bray, on the other hand, held that the plaintiff's action was founded on tort, and was maintainable without alleging any contract; that the delivery of the coke sold was done in execution of the defendants' public duty or authority, and that the defendants were protected by the statute.

There being no conclusion arrived at by the Divisional Court, the judgment of the County Court judge held good, and an appeal was made to the Court of Appeal, which held that there was no obligation created by statute under which the Bradford Corporation were bound to supply coke to the plaintiff, but when they did so they entered into a voluntary private contract, and not in the execution of any public duty or authority. Lord Justice Swinfen-Eady distinguished this from the case of a public authority which works a tramway where it is their duty to admit any person as a passenger who presents himself and pays his fare, and behaves himself properly. Strictly speaking, he said, there was no contract between the public authority and the passenger, because there was no volition on the part of the authority to make a contract with the intending passenger. The fact was they were bound to make the contract with the passenger if he chooses to make it with them, so that it is really not a case of contract which only occurred in law when the parties to it made it of their free choice. There is no case in which it was freely at the option of the public authority seeking the protection of the Act either to make or to refuse to make a particular contract to which it has been held that the Act applies.

It is a matter of some importance to builders and contractors who have dealings with public authorities to have the matter definitely settled that when they have entered into contracts with a local authority for specific purposes the authority cannot bar a claim upon them which is based upon contract because an action has not been brought within six months. This was settled in the case of the Midland Railway Company against the Withington Local Board ([1883] 11 Q. B. D. 788), which was an action to recover back money paid to the defendants in respect of works of sewering, etc., in an alleged private street. The action was held to come within the scope of sect. 264 of the Public Health Act, 1875, and was brought too late, but the Master of the Rolls said that if the action had been brought for something done or omitted to be done under an express contract the section would not apply.

But in cases where there is no express contract between the plaintiff and the local authority the authority can claim the protection of the Act if an action is not brought within six months of the occurrence.

It is not always easy, however, to determine when the "act, neglect, or default complained of" has happened, and everything depends upon the time from which the six months is to be reckoned.

In the case of Backhouse *v.* Bononi ([1861] 9 House of Lords Cases 503) A. was the owner of certain houses standing on land which was surrounded by the lands of B., C., and D. E. was the owner of mines running underneath the lands of all these persons. He worked the mines in such a manner (without actual negligence) that the lands of B., C., and D. sank in; and after more than six years' interval their sinking occasioned an injury to the house of A. A. brought an action against E., and the defence raised was that the action was barred after six years from the working in the mine which caused the sinkage; but the Court held that the right of a person to the support of the land immediately around his house is not in the nature of an easement, but is the ordinary right of enjoyment of property, and till that is interfered with he has no legal ground of complaint, although, in fact, something may have been done which (without his knowledge) has occasioned results that will afterwards affect his property, and therefore the action could be brought at any time within six years after the enjoyment of the house was interfered with by the actual occurrence of the mischief.

In the case of the Darley Main Colliery Company against Mitchell ([1886] 11 Appeal Cases 127) similar circumstances were under consideration. The lessees of coal under Mitchell's land worked the coal so as to cause a subsidence of the land and injury to houses thereon in the year 1868, and compensation was made for the injury then caused. No further workings were made, but in 1882 a second subsidence took place, again causing injury, but it was found that there would have been no such later subsidence if the lessees had left enough support under the respondent Mitchell's land. The House of Lords decided that the cause of action in respect of the further subsidence did not arise till that subsidence occurred, and that the respondent could maintain an action for the injury thereby caused, although more than six years had passed since the last working by the lessees.

The two examples cited have no reference to public authorities, but the case of Crumbie *v.* Wallsend Local Board ([1891] 1 Q. B.) was an action under somewhat similar circumstances in which a public authority was concerned. The facts were that the local board made an excavation under a street for the purpose of laying a sewer. The excavation was not properly filled in, and in consequence subsidence of the plaintiff's land with injury to houses thereon took place, which began at a period more than six months before and went on continuously down to the commencement of an action by the plaintiff in respect of the damage caused by the subsidence. The defendants urged that no fresh cause of action had accrued within six months before the date of the writ, and that the continued damage during that period did not constitute a fresh cause of action, but the Court of Appeal held, following the decision in Darley Main Colliery Company *v.* Mitchell, that an action could not be brought for the excavation (which took place more than six months before), but that a cause of action arose when damage to the plaintiff's property resulted therefrom by subsidence, and that each fresh subsidence which did not exist the day before gave a fresh cause of action. Lord Justice Fry said the sole question was whether the cause of action accrued within six months before action brought as required by sect. 264 of the Public Health Act, 1875, and he concurred in the view that each fresh subsidence created a cause of action within the meaning of the section.

The case of a continuing injury was considered in Hague *v.* Doncaster Rural District Council ([1909] 100 L. T. 121). The plaintiff was the occupier of farm lands, and he sued the defendants for damages for the death of certain cattle owing to the pollution of a stream flowing through his land by an effluent discharged into the stream from sewage works belonging to the defendants. The claim specified the death of three animals in November, 1906; July, 1907; and September, 1907; but the action was not commenced until April 22, 1908, and the defendants relied upon the Public Authorities Protection Act, 1893. In the County Court the judge held that the Act afforded no protection to the defendants, and gave judgment for the plaintiff for damages. This decision was upheld by the Divisional Court on appeal, and Mr. Justice Bigham, as he then was, said the action was brought in respect of an act done by the defendants in pursuance of a public duty, and, when one asks what the act was in respect of which this action was brought, the act is and must be the pollution of the stream. That is the act

which the defendants did in pursuance or execution of their duty. They did not kill the cows in the execution of any duty at all. He did not know when the pollution began, but it began before the death of any one of the three cows, and it continued down to the moment when the action was commenced. He was of opinion that the act complained of was a continuing act, and there was a continuing injury by means of which the defendant suffered damage. He therefore came to the conclusion that the action was instituted in the case of a continuance of an injury or damage within the meaning of the Public Authorities Protection Act, and, having been brought before the matter complained of had ceased, the limitation placed upon sect. 1 of the Act, which would have applied in other cases, does not apply since the action was brought in time.

A similar decision was given in the case of Harrington *v.* Derby Corporation ([1905] 1 Ch. 205) and from dicta of Mr. Justice Buckley, as he then was, it might be gathered that he regarded the decisions in the cases of Backhouse *v.* Bononi and Darley Main Colliery Company *v.* Mitchell as applicable to cases in which public authorities as distinguished from private persons or private trading corporations are concerned; but there is apparently no decision directly bearing upon the point, and it may be gathered from the judgment of Mr. Justice Bigham and the decision in Crumbie *v.* Wallsend Local Board, quoted above, that except in the case of a continuing injury the date from which the six months are to be reckoned is the date of the "act, neglect, or default complained of," and not the time when the damage results from the act, etc., and it is very doubtful whether, if an act is committed by a public authority more than six months before the damage shows itself, any action at law can be successfully maintained against them.

LAW REPORT.

Workmen's Compensation Act: Award against Builder.

AT Clerkenwell County Court on December 22, before his Honour Judge Howland Roberts, a claim under the Workmen's Compensation Act was made against Mr. William Green, builder, of Cressida-road, Holloway, by Maud Cane, a widow, of Anatola-road, Dartmouth Park-hill, N.; in respect of loss of her husband.

Mr. Giveen was counsel for the applicant, and Mr. Tindal Atkinson appeared for the respondent.

Evidence was given to the effect that applicant's husband, James Cane, while employed by Mr. Green, and engaged on work at a house in Miranda-road, received fatal injuries through some brickwork falling upon him.

Judge Roberts observed that he had to decide whether the accident arose out of, as well as in the course of, deceased's employment as a builder's labourer. Mr. Green had a job of underpinning a wall at the house in question, and deceased, who had only been in his employ for five days, was told to clean up the bricks, and in his spare time to go and help the plasterer inside the building. In the absence of respondent, deceased was seen knocking away at the brickwork of the wall where the underpinning was going on. A little time afterwards there was a fall of brickwork. Deceased was discovered with bricks lying upon him, and he died shortly afterwards from the injuries sustained. Was there any evidence to satisfy him (the Judge) that at the time of the accident the deceased man was doing work within the sphere of his employment? The evidence in regard to that was conflicting. Witnesses called on behalf of the applicant said it was a common practice for builders' labourers to do this class of work, and on small jobs especially. One witness, with eighteen to twenty years' experience in the building trade, said it was usual for labourers to do the cutting away of brickwork under the direction of the bricklayer, and in cross-examination he said it would be a proper part of a builder's labourer's work to cut away footings. On the other hand, the respondent, in his evidence, said that in his practice he never allowed any labourer to do that. He said: "A labourer never touches brickwork when in my employ. I do all the cutting away." Mr. Green might have his own particular rules, but unless he (the Judge) could come to the conclusion that some special orders were given to the workman when engaged, he did not think that would be sufficient to say that the ordinary sphere of a builder's labourer was limited in this case. There was no evidence as to any special orders being given at the time the deceased was engaged. Orders were undoubtedly given to the man by his employer when the latter went away from the job at three o'clock; but that was an entirely different question. That seemed to raise the question as to in what manner work was to be done rather than what work was to be done by deceased. If nothing was said to a workman at the time of his engagement, limiting the actual work he was engaged to do, was there anything to show that the man was not engaged in the ordinary way to do that which a builder's labourer would ordinarily do? His Honour did not think there was. Deceased was employed as an ordinary builder's labourer, and no instructions were given him one way or the other. On the day of the accident instructions were given him to do certain work. The man did what was in disobedience of his employer's orders, but did that limit the sphere of his employment? His Honour thought the answer to that must be "No." Although the man left work which he was specially told to do, that was disobedience which did not limit the sphere of his employment as a builder's labourer. The conclusion he (the Judge) must come to was that the accident arose not only in the course of the man's employment but also out of his employment. The widow was therefore entitled to compensation, and he entered judgment in her favour for £210 12s., and allowed costs on Scale B.

CLIMATE AND ARCHITECTURE.

ARCHITECTURE is affected by many influences, amongst others may be mentioned race, climate, materials, religion, and social conditions. Of all these influences climatic conditions have had the most obvious direct effects. It is not proposed to consider how, indirectly, architecture has been affected through the influence of climate on the personality of the architect. Different people hold different views on this matter. We may quote the late F. W. Moody as being interesting: "A southern climate seems to affect and elevate the imagination as much by its genial influence on the organisation of man as by the beauty of the scenes it presents. . . . I fear we must conclude that those who are, as it were, habitually saturated with the larger and more ideal aspects of nature, and whose life and faculties expand under their influence, must, in the long run, be superior to those who dwell in a less genial climate." Considering more direct influences, we may note that climate is the principal factor that determines the type of roof and window of any building. The former is the more important, for the history of architecture is very largely the history of roofing. With regard to fenestration, Mr. Walter Cave says:—"It was not till the time of the Roman Empire that the admission of light came to be considered as an integral part of the design."

A climate such as that of Egypt, which is very hot with a slight rainfall, results in the use of a flat roof, the simplest method of protecting a building from heat; the exclusion of wet being of secondary importance, a sloping roof becomes unnecessary. To obtain light only small openings are used, it being natural in a hot and very sunny climate to prefer a dim light, as a relief from the outside glare. In sunny lands artists seem to use bright colours naturally, and details are refined. We see all these results in the ancient architecture of Egypt, even down to the vividly-painted ornaments and delicate reliefs. One important point to be remembered in designing buildings for Europeans in the tropics is that the white man needs protecting from light rays, which are very harmful to the nervous system, as well as from heat. "The pigmentation in the skin of a coloured man cuts off light rays, and he has therefore only to shield himself from heat rays to be perfectly comfortable." The flat roof is still generally employed, and is very convenient for dwelling-houses, as it affords pleasant sleeping spaces during hot weather.

Greece has brilliant sunshine and less heat, but more wet, to contend with than Egypt; the consequence is that the slightly sloping roof, by means of which rain-water is conveyed from the building, becomes a necessity. The slope adopted for the roof settled the proportion of the pediments. The natural method of excluding wet from a building with a pitched roof is to make the roof plane advance beyond the external face of the wall, thus covering the joint between the roof and wall; as a result we obtain the cornice, which may be said to spring out of an absolute constructive necessity. The Greek temple was beautified by the addition of the peristyle, which is of great value as a protection from sun and rain, and which keeps the building behind cool. The sculptures are also protected from the weather. The main frieze in the Parthenon is under the peristyle, while the frieze of the external Order and the sculpture in the pediment had great projecting cornices over them. The details and ornament, owing to the abundance of bright sunshine—and to the marble employed—are extremely delicate and refined, and colour decoration was freely used.

In Italy climatic conditions are very similar to those of Greece, so that it is evident that the modifications made by the Romans in developing their architecture, partly on Greek lines, were not due to differences of climate.

Romanesque churches were built in the South of France with a ribbed barrel vault over the nave, supported by a half-barrel vault over each aisle. Such an arrangement allows of no clerestory and becomes less suitable, owing to lack of light, the further north we go.

In northern countries, where we have more rain and occasional snow to encounter, steeper roofs are advisable, with ordinary building materials, than those used in Greek and Roman buildings. Windows are larger and details to be satisfactory must be bolder.

The use of groined vaulting, instead of a continuous barrel (as had been discovered in Rome), allowed light to be obtained in the upper part of a building, and in Romanesque architecture, particularly in the northern parts of France and in England, groined vaulting was developed for this purpose.

The use of the round arch in groined vaulting led to many difficulties, and ugly stilted arches had sometimes to be used. The application of the pointed arch did away with all these difficulties; by its use ample light was provided, and this method of construction became the normal one in the north of France and in England.

When the Renaissance in architecture spread to England and France it did not at first entirely upset traditional methods of building; thus "we find in the Early Renaissance chateaux of France the steep roof and the great chimney-stack, and in England Inigo Jones's Coleshill retains these features."

BUSINESS PREMISES, REGENT-STREET, W.

Building operations are in progress in Regent-street at the corner of Little Argyll-street, W. The general elevation will conform to the design of the premises at Oxford-circus, already carried out by Mr. Henry Tanner, F.R.I.B.A. Part of the new structure will be a branch of the Union of London and Smiths Bank, Ltd., the architects for which are Messrs. Dunn, Watson, & Curtis Green, Lincoln's Inn-fields, W.C. The remainder will be occupied by Messrs. Dickens & Jones, Ltd., for whom Messrs. Stephens & Munt, Hans-road, Knightsbridge, are acting. The general contractor is Mr. James Carmichael, Trinity-road, Wandsworth, S.W.

BUILDING MATERIAL AND EQUIPMENT, NEW ZEALAND.

H.M. Trade Commissioner in New Zealand has forwarded extracts from the local Press, from which the following particulars are taken:—The ratepayers of Auckland have authorised the municipal authorities to raise a loan of £115,000 for the purpose of carrying out the following works:—Erection and equipment of market buildings, £55,000; establishment of a fish market, £20,000; water supply in Grey Lynn, £10,000; construction of drainage works at Remura, £30,000.

THE BUILDING TRADE.

THE REBUILDING OF BELGIUM.—I.

WE have received the following statement of the nature of the proposals for the rebuilding of Belgium, how they will be financed and their proposed scope, from an eminent Belgian architect now in this country, and it may be regarded as practically official:—

"The Belgian refugees in England and France had scarcely settled themselves into their temporary homes before, with that propensity of co-operation which is so characteristic of the nation, they began to arrange meetings for the interchange of their ideas on the reconstruction of Belgium.

In a very short time this movement was widely extended in every direction, and became of such importance that the Belgian authorities themselves were drawn into it. On February 11, 1915, an International Congress was held in London solely to discuss the question of the reconstruction of Belgium.

The Belgian Minister of Public Works presided, and among those taking part were the directors of the English Garden Cities and Town Planning Association (who had organised the Congress), delegates from Holland, Russia, and Poland, and different members of the Commission Royale des Monuments de Belgique.

His Majesty the King of the Belgians honoured the Congress with his most marked support, and telegrams of congratulation were exchanged between the King and those present at the Congress.

Other associations have been created at the same time on similar lines both in England and France, and even in the country now under enemy occupation. Some of these societies are provincial, and their aim is to collect information regarding those who have suffered through the war, to watch over their interests, and to arrange for the complete restoration of all kinds of damaged property. They will also, directly if it is possible, work at the improvement of the economic situation in the province. Each of these Provincial Committees has already formed Sub-Committees for the Arrondissements.

In short, there exists a complete and well-organised scheme which is steadily enlarging its scope, and the Belgian who is throwing all his heart into this work for the regeneration of his country has the feeling, perhaps illusory, but none the less comforting, that during this time of preparation he is thus drawn closer to his native land.

Faced by this great rush of eager workers, and of minds fertile in new ideas, it became necessary to plan out their course, and the Belgian Government, in the person of the Minister Helleputte, architect and engineer, passed a law whose different clauses defined the exact limits within which this movement of reconstruction might work.

This law, dated August 25, 1915, prepares for the new conditions of reconstruction for towns and monuments, and even for private property. It reads as follows:—

Article 1. "Vu l'article 26 de la Constitution, qui confère l'exercice du pouvoir législatif au Roi, à la Chambre des Représentants et au Sénat;

Vu l'impossibilité de réunir les Chambres législatives;

Sur la proposition de notre Ministre de l'Agriculture et des Travaux Publics.

Nous avons arrêté et arrêtons:

Article 1er. Les communes sur le territoire desquelles des constructions publiques ou privées ont été détruites par suite des faits de guerre, sont tenues d'établir des plans généraux d'aménagement destinés à servir de base aux autorisations de construire ou de reconstruire, à délivrer le collége échevinal.

Le Ministre de l'Agriculture et des Travaux Publics peut, à la demande des administrations communales intéressées, dispenser celles-ci de cette obligation, soit pour une partie, soit pour l'ensemble de leur territoire." *

This clause shows that the Belgian Government wish the towns to be rebuilt in accordance with modern æsthetic and hygienic ideas. The Government will leave the work of preparing plans for the towns to be rebuilt in the hands of the municipalities and with the former owners of the ground, which is divided into very small lots.

At the same time the clause provides (only in the case of some unimportant communes, no doubt) that the municipal authorities may be left free to deal with financial questions, so that they are not compelled to obey the laws laid down for towns whose resources would permit them to carry out the most elaborate schemes.

Article 2. "Ces plans doivent être approuvés par le Roi. Lorsque l'importance des projets le comportera, le Ministre de l'Agriculture et des Travaux Publics soumettra les plans, pour avis, à une commission spéciale composée de:

1. Les membres correspondants de la Commission Royale des Monuments et des Sites résidant dans la partie non envahie de la province.

2. Les membres effectifs de la Commission Royale des Monuments et des Sites résidant dans la partie non envahie du pays.

3. Un membre de l'administration communale intéressée.

Cette commission sera présidée par le Gouverneur de la province ou, à son défaut, par un député permanent.

A partir du moment où la capitale, sera libérée, la Commission spéciale sera composée des membres effectifs de la Commission Royale des Monuments et des Sites, résidant dans la partie non envahie du pays et d'un membre de l'administration communale intéressée.

Elle sera présidée par le président de la Commission Royale des Monuments et des Sites." †

This clause states that the "Commission Royale des Monuments et des Sites," formed entirely of artists, engineers and architects of well-established reputation, will be the final judges of the completed plans for the large towns. In other words that these plans will be carefully and skilfully examined, and that the Belgian towns after the war will look beautiful and artistic, while at the same time they will be hygienic and practical.

The six other clauses deal with the approval of the new buildings by the communal and provincial authorities, with the expropriation which it will be necessary for the State or the communes to make, and with the penalties which will be inflicted for violations of the law.

It is clear, therefore, from our examination of this law that from now onward Belgium is ready for the moment when it will be possible to start on the work of restoring her ruins. The Belgian Government has also made arrangements for the temporary housing of refugees on their return to their country, and could at once send into the country all the materials necessary for the erection of temporary shelters as soon as their territory is evacuated.

Two questions present themselves on the mind directly the restoration of the towns is spoken of.

Where will Belgium find the necessary money, and where, having the money, will she obtain building materials? For the money it will be necessary to resort to private enterprise, foreign but allied; principally, of course, England will provide it. And for building materials also we must look to England. But these questions, which are of the greatest importance, must be discussed in another article.

CHAS. PETEIN,
Architect (Brussels)."

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* In pursuance of Article 26 of the Constitution, which gives legislative power to the King, the Chamber of Representatives, and the Senate; and in view of the impossibility of calling the legislative Chambers together it is decreed as follows:—

Article 1. The communes of that part of the country where public and private buildings have been destroyed by war are expected to draw up schemes of reconstruction to be deposited with the municipal authorities. The Minister of Agriculture and Public Works can, at the request of the interested districts, relieve them from this obligation in whole or in part.

† Article 2. Schemes must be approved by the King. If the importance of the proposals makes it necessary, the Minister of Agriculture and Public Works will submit the plans to a Special Commission composed of—

1. The corresponding members of the Royal Commission of Monuments and Sites who live in the undevastated parts of the country.

2. The working members of the Royal Commission of Monuments and Sites who live in the undevastated parts of the country.

3. A member of the interested communal authority.

This Commission will be presided over by the Governor of the Province or, in his absence, by a permanent Deputy.

When the capital is evacuated by the enemy the Special Commission will be composed of the working members of the Royal Commission of Monuments and Sites who live in undevastated parts of the country and a member of the communal authority interested, and it will be presided over by the President of the Royal Commission of Monuments and Sites.

SOME POINTS ABOUT PUBLIC WORKS CONTRACTING IN BELGIUM.

By LEON LOOTENS, Contractor of Public Works in Ostend, President of the Provincial Federation of Contractors in West Flanders; and HENRI VOLCKERICK, Advocate, Counsellor of the Antwerp Chambre Syndicale of Contractors.

1. Concerning contractor's right to a lien upon the works until paid.

2. Concerning the special privileges enjoyed by suppliers of goods to contractors for works for the Belgian Government.

3. Concerning building owner's right to cancel contract in certain circumstances.

4. Concerning the determination of a contract in event of the death of the contractor.

SOME time ago the Builders' Merchants' Alliance, Ltd., published in London a pamphlet denouncing the dishonest practices perpetrated by land-jobbers and speculative building owners against contractors and their suppliers, and pointing out the want of a legal protection against such unfair devices. The author, Mr. W. H. Dowler, of Liverpool, characterises such a situation as "a crying trade scandal." It is a severe but justified criticism.

The reading of the above pamphlet has given the writers the idea of setting forth to British traders the means provided by Belgian Law for dealing with certain incorrect and somewhat similar operations in use in Belgium. This short exposition may help to prepare that reform of the law which the British Building Trade desires so urgently as the means of abolishing the intolerable grievance analysed by Mr. Dowler.

The knowledge of the exceptionally favourable situation created by the special protection conferred by Belgian Law upon contractors, and collaterally upon their suppliers, may facilitate commercial relations between British manufacturers of plant and materials and Belgian contractors, and facilitate the granting of the credit which will be asked for and may safely be extended to Belgian buyers after the war, when business and trade are resumed.

So this account of Belgian Law and of its mechanism will serve the double purpose of being useful to the traders of two countries united by so many common interests and by a daily increasing reciprocal esteem.

The most beautiful buildings have defects. So it is in the case of laws. It will be useful, therefore, after having stated the advantages, to point out the inconveniences of Belgian Law, and to indicate the methods of avoiding the latter by means of the contractor's privileged

rights and by the attentive prudence of a wise trader.

1. Concerning Contractor's Right to a Lien upon the Works until Paid.

In order to favour the development of building, the Belgian Law has created a particular right, which confers a great advantage on contractors of works both from their personal point of view and that of their creditors, and consequently improves their credit if used.

This law, while providing for the general case of the owner carrying out work on his property (land, buildings, or works), places at the contractor's disposal a means of securing against the owner and his creditors the debt arising out of the execution of the work. It has been inspired by the following considerations :—

1. The contractor who improves land or who puts up, reconstructs, or repairs any building or work, adds to the value of the real estate the value created by the works, viz., the materials, the supplies, and the wages of workmen and employees spent thereon.

2. The contractor receives payment of the price either by instalments, according to the progress of the works, or at their completion, or even at a less or more distant date after their completion.

3. The contractor is always money out of pocket until the final settlement of the accounts of the undertaking, seeing that he must pay with the punctuality and the regularity of a merchant the wages of his workmen and employees and the invoices of his suppliers.

4. The owner's financial position may be altered either during the works or before the payment of the price of the undertaking or of its remainder.

5. Unknown to the contractor the owner may sell or charge with privileges or mortgages the property on which the works are executed.

6. The speculator of bad faith may grow rich at the expense of the contractor.

7. Under the scheme of taxation buildings bring more into the public treasury and, therefore, it is to the public interest that building should be encouraged.

These various considerations have caused the establishment of a special lien or privilege in favour of the contractor.

This privilege has a distinctive characteristic. While other privileges are acquired without any formality by virtue of the law, and take their rise at the same time as the debt to which they apply, the privilege of the contractor is only acquired by the observation of certain formalities, in default of which various combinations of credit and security may cause the privilege to disappear.

Those simple formalities are of a double kind; they precede and follow the works; they are :—

(*a*) *Before beginning the works* :—(1) To obtain the appointment of an expert to estimate the value of the property in the then condition of the land, works, or buildings (this appointment is made on a petition laid before the President of the tribunal of first instance of the district in which the works are to be carried out), and (2) to inscribe the report of the expert on the record of the conservator of mortgages of the same district, and, the case occurring, to call the attention of the privileged creditors or mortgagees already similarly inscribed against the property to the said valuation.

(*b*) *After completing the works* :—(1) To obtain the appointment of an expert to estimate the value of the property in its new condition (this appointment is made in the same manner as the previous one), and (2) to record similarly the second report.

If the acceptance of the work does not occasion any difficulty between the owner and the contractor, the latter ought to proceed to the second valuation and its recording within a fortnight of the acceptance. On the contrary, if the acceptance gives rise to differences, the contractor ought to proceed within six months of the completion of the works to have them accepted by the expert entrusted with the second valuation, and to the recording of the report of acceptance and valuation within a fortnight of its date.

Practically but one petition fulfilling the double object required by the law is laid before the magistrate, who appoints an expert charged with the double valuation, and, also, the case occurring, with the acceptance of the works; but this expert draws up two separate reports at the above indicated times.

To whom belongs the initiative of those simple and quick proceedings? Three cases may occur :—

(*a*) Contractor and owner, when signing the building contract, agree to constitute the lien or privilege; then the petition will be drawn up in the names of both interested parties.

(*b*) The owner, regardful of the contractor's interest, of his own accord concedes the lien or privilege to the contractor; in this case, the law gives expressly the initiative to the owner.

(*c*) The owner objects to grant the lien or privilege; in such a case the contractor has a right of acting alone. If the terms of the law do not expressly provide for the contractor's initiative, they do not exclude it; they mention the intervention of the President of the tribunal in virtue of his office; but the action of a magistrate in virtue of his office may be urged by anyone interested in the matter, and more especially by the contractor for whose benefit this action is necessary.

By the observation of those formalities the contractor becomes a privileged creditor, and secures on the selling price of the property a preferential right to the amount of the surplus value of the property disclosed by the difference between the two valuations as resulting from the works carried out on the property.

The contractor's lien or privilege ranks from the day the first official report has been inscribed on the record of the conservator of mortgages; in other words, preferred rights which may originate against the owner between the date of recording of the two official valuations cannot prejudice the claim of the contractor, so far as the difference between the valuations is concerned.

In Belgium, immovable property or real estate is submitted to a system of legal publicity, organised by means of official registers kept by a functionary of the Government, who is called the Conservator of Mortgages. He who does not appear on those registers as an owner of an immovable property, or as a titulary of an immovable right, or as a titulary of either a privileged or mortgaged right, or as a tenant of an immovable property for a long term, may not exercise any rights against the property to the prejudice of third parties.

The registers of mortgages are public and may be referred to by everyone interested in the matter.

The lien or privilege established by Belgian Law will be better understood from a few examples of cases in which a contractor may find himself, either because too confiding, too negligent, too ignorant, or too afraid of prejudicing himself with clients to exercise his right of privilege.

1. A contractor, without taking proper precautions against the owner, accepts, carries out, and delivers a work and remains creditor, in whole or in part, for the price. If the event proves that the contractor had shown mistaken confidence in granting credit to the owner, he possesses the rights of an ordinary creditor, and has to share in the whole property of the owner when all the claims enjoying preferred rights have been paid out of the proceeds of the sale of that part of property upon which the preferred rights are secured.

2. A similar situation arises even when the contractor learns of his client's financial disability prior to entire completion of the work, as it is then too late to have recourse to the double valuation and recording referred to.

3. A contractor, without making use of this easy means of securing his lien or privilege, is engaged in the works, when the owner's condition is modified and gives rise to grave apprehensions as to the payment of the price. In this hypothesis, if the remnant of the works to be finished is relatively important, and if the contractor finds it to his advantage to complete the works, he may still have recourse to those special proceedings in order to secure the residue of his claim. By so doing the contractor does not cause an injury to anyone, for he takes the situation such as it exists at that time, and he submits to its consequences by the loss of his lien for a part of his claim. He exercises only that part of his right not already lost by his previous inaction; he is not bound to leave to the owner and his creditors a gratuitous advantage by completing the works.

In both above cases the contractor against whom no justified causes of complaint may be made enjoys against the owner, and collaterally against his creditors, several means of action—for instance, he may interrupt or suspend the work; he may refuse to deliver the finished work; he may demand from the Court the dissolution of the agreement. Such measures have nothing to do with the lien or privilege. It is unnecessary in this study to enlarge upon them; it is sufficient to indicate them.

How different and strong throughout is the position of the contractor who takes the authorised precautions, and proceeds to the double valuation and the double record in of his lien. Such a one thereby acquires a new, particular, and additional right to be preferred to the other creditors of the owner, and to be paid in priority of them out of the proceeds of the property's sale within the limits of the difference between the two valuations, provided the selling price of the property reaches at least the aforesaid difference.

Some figures and some cases of application will make the mechanism of the contractor's lien or privilege more striking.

The work is agreed for, say, 100,000 francs. The first valuation gives to the property on which the contractor is about to work a value of 50,000 francs; the second valuation made after the completion of the works assigns to the property in its new condition a value of 130,000 francs. These two valuations show that the works carried out by the contractor have added to the property a surplus value of 80,000 francs. By virtue of Belgian Law the contractor's claim is privileged to the amount of this surplus value.

If the property realises, on a sale to liquidate the owner's indebtedness, 130,000 francs, the contractor, creditor for the whole contract price and the only privileged creditor, will receive in preference and priority 80,000 francs; he will remain an ordinary creditor for the residue of his claim and share in the distribution of the remainder of the debtor's estate along with the other ordinary creditors in proportion to the amount of all the claims.

If the first valuation has been recorded before beginning the works, and if the owner, who at that time had no other engagements, contracts afterwards and before the recording of the second valuation a series of preferred and mortgaged debts on the property in question, the contractor has not, in principle, to fear those new privileged and mortgaged debts, because they rank only after his claim, unless his claim exceeds the amount of the surplus value ascertained by the double valuation. Thus, for instance, if the owner has charged the aforesaid property with new privileged and mortgaged debts to an amount of 60,000 francs, the contractor will receive in preference and priority 80,000 francs out of the selling price of the property; the remainder, that is 50,000 francs, will go to the other privileged creditors and mortgagees, according to their rank and their order of recording. The contractor, for his residue of 20,000 francs of the contract price, and the other privileged creditors and mortgagees for their remainder of 10,000 francs on the amount of their claims, become ordinary creditors; those residues are joined to the amount of all the ordinary claims; the total thus obtained will serve to calculate the dividend to receive after realising the remainder of the uncharged real and personal estate of the building owner.

If, before thinking of building, the owner charges his property with privileged debts and with mortgages duly recorded, and if the whole of these combined debts amounts to 30,000 francs, the situation of the contractor who has secured his special lien or privilege is the following :—On 130,000 francs proceeding from the property's sale, 30,000 francs will be used in priority for the payment of the aforesaid privileged and mortgaged debts; a residue

of 100,000 francs remains, of which 80,000 francs will be placed in preference and priority at the disposal of the contractor, and 20,000 francs remain to be divided between the contractor and the other creditors in proportion to the amount of their respective claims.

In the intermediate hypothesis of the contractor proceeding to the first valuation after beginning the works the supposed figures must be a little modified, and the property's value at the time of the first valuation will be greater, for instance, say 60,000 francs. There remains for the contractor a surplus value of 70,000 francs, which is the limit of his privileged right. He will receive this amount out of the selling price so far as the payment of the privileged and mortgaged debts contracted and recorded prior to the recording of this first valuation leaves an available residue; for the remainder of his claim the contractor is treated as an ordinary creditor.

It is obvious that the contractor may improve his situation by getting payments on account according to the progress of the works. The figures of the last example demonstrate this. If the instalments paid during the works have reduced the contractor's claim to 50,000 francs, this residue would have been totally paid out of the selling price of 130,000 francs, whatever may be the amount of the privileged and mortgaged debts contracted on the property by the owner after the recording of the first valuation.

It may happen that the contractor delays too long in proceeding either to the first valuation or to its recording; in the meantime the owner contracts sundry privileged and mortgaged debts on the property which the diligent creditors have had recorded. In such a case the contractor has to bear the consequences of his delay. His preferred right reckoning only from the recording of the first valuation, he will only receive the amount of his claim (limited to the surplus value resulting from the double valuation) in second or in third rank. Therefore, it is absolutely necessary that the contractor acts promptly and hurries on the first valuation and its recording.

A last case may occur. The contractor fails to have the second valuation recorded within the fortnight after the reception of the work as prescribed by the law. In this event he loses his privilege. But the Belgian Law considers the contractor's claim with such great favour that it still grants to him in such circumstances a mortgage on the property to the amount of the surplus value; this mortgage ranks from the date of its recording, which is that of the second valuation.

Although Belgian contractors are entitled under their national law to the considerable advantages aforesaid, they seldom or never make use of them. They do not appear to prize the benefits they might get from the exceptionally favourable situation available to them. They do not consider that this privilege, by reducing the risk, would allow them to decrease their prices, entailing an increase of business. They fear that such an act of elementary commercial prudence may be misinterpreted as an act of injurious and unjustified distrust, and that annoyed customers may apply to less prudent fellow-contractors. Rather than risk losing a job they prefer to risk not being paid, because they are gratuitously leaving the surplus value created by their work to be alienated to a mortgagee or shared with the ordinary creditors of the building owner if the latter should fail to meet his obligations.

That is false and short-sighted reasoning. The new circumstances produced by the war will, doubtless, induce Belgian contractors to change their old and erroneous practises, and bring them to use generally those legal means of securing their claims. After the war, at the time of the restoration of their country, Belgian contractors will be obliged to ask for great facilities and long credits from their suppliers. Certainly their good commercial and industrial reputation before the war will be a weighty element in their favour, but they will mightily increase their credit facilities by availing themselves in future of the privilege accorded to them by the law. They have at their disposal an exceptional, valuable, and easy means of getting privileged claims on immovable properties, and, consequently, of being able to assign those rights and the collateral privileges attached thereto in order to secure the payment of the materials and plant furnished to them on credit. That security is a real one; for a notice of the assignment given to the building owner and an alteration of the original recording on the register of mortgages into the name of the supplier are sufficient to prevent the contractor receiving a valid payment or the owner obtaining a regular cancellation of the inscription on the register of mortgages, and thus freeing his immovable property to the detriment and without the intervention of the supplier.

2. Concerning the Special Privileges enjoyed by Suppliers of Goods to Contractors for Works for the Belgian Government.

The privilege which has been analysed applies to public as well as to private works. But, in reality, because, in principle, public property is for the most part inalienable, and on account of the rules governing public finances and the administrative hierarchy, this privilege is of no practical value in the case of works on account of a public administration. The contractor may invoke, however, the intervention of the superior authority to act on the unable or refractory minor authority; and, as a last resort, he can have a question put to the Minister to whom the administration in default is dependent, or may summon the Minister himself, if he fails to carry out obligations arising from a contract interesting his department.

If Belgian administrations should renounce the practice they have observed for years past, of reserving to themselves the execution of all public works, and concede them to private persons or to companies, the practical utility of the privilege would reappear whenever the concessionaire carries out those works on land fully conceded to him.

But as regards public works the Belgian Code of Laws contains a second advantage peculiar to Government s works, the knowledge of which is of the greatest interest to suppliers of contractors.

The period of the French Revolution introduced into Belgium a law of 26th pluviose an II. (February 14, 1794), which has received recently a formal application by a judgment of the Belgian Court of Cassation. It confers upon suppliers of contractors of works executed, or to be executed, on account of the Government an advantage which may be called the most perfect privilege in the Belgian legislation.

This law forbids the individual creditors of the contractors for Government's works to attach the funds allocated thereto. It reserves the right of attachment to two classes of creditors only, namely, the workmen employed on those works, and the suppliers of materials and other articles for the purpose thereof. But the balance which the Government may owe after reception of the works can be attached by the other creditors, after the workmen employed on the works and the traders who have supplied the articles used on the works have been paid off.

In other words, furnishers of plant and materials destined for a determinate work done or to be done on account of the Belgian Government enjoy the enormous advantage of coming before the contractor's other creditors—that is to say, before the possessors of claims which are not directly connected with that work, and also of being able to receive in priority the amount of their bills out of the funds reserved by the Belgian Government for that work. They have the right of setting aside all attachments against these funds made pending the execution of the work by creditors unconnected therewith. They have to reckon only with attachments on the part of workmen employed thereon. And when the work is taken over, suppliers of articles relating thereto may still hinder the other creditors of the contractor from receiving the balance retained by the Belgian Government, except what remains after payment of the wages of the workmen employed and of the goods supplied to the said work.

The purveyor who delivers on credit to a contractor the necessary plant and materials for a work conceded by the Belgian Government has an almost complete certainty of being paid out of the funds reserved by the Belgian Government therefor. It is sufficient to keep a watchful eye over the progress of the work and over the payment of instalments by the Government, and, in case of a refusal to pay by the contractor, without a serious motive to apply to the proper Minister in order to stop the next instalment.

The text of this special law has in view sums owing for supplies of materials and other articles serving for the construction of the works. The expression "other articles" is general and includes money advances made in respect of such a work; the banker who opens a credit to a contractor for the execution of a Government's work is a supplier of articles in the same sense as the seller of plant and materials.

One of the consequences of this excellent law, bequeathed by the Great Revolution, and which fits so well the present circumstances, is that the Government has the power but not the obligation of requiring from the contractor evidence of payment of the workmen's wages and of the suppliers' bills. The administration of the Belgian State which has not been warned by a creditor of the contractor will make its payments in the usual manner and will not take upon itself the supplementary and unpleasant task of interfering with another's business.

If attachments have been made for reasons foreign to the Government's work, or if notice of assignments has been given, and nobody objects, the Government will pay according to the ordinary rules governing attachments and assignments, and as if the law in question did not exist. Thus it is necessary, in this as in other matters, to watch the progress of and the payment for the works, and to choose a favourable opportunity to intervene.

The following is a very characteristic example of the application of this law:—

Several years ago an Antwerp contractor became bankrupt. He left in suspense the payment of the workmen's wages and the bills of some suppliers, in respect of an inclined way leading to the elevated yards of the Belgian Government's railway in Antwerp. Payment of the balance of the contractor's accounts had not been made by the State's department. The official receiver in bankruptcy obtained settlement and received from the Government payment of the outstanding sums. The workmen for their earned wages on the said work, the suppliers of the materials used thereon, and a blacksmith for the construction and the setting of an iron railing, asked, in virtue of the law of Pluviose, for payment of their claims in preference out of the sums paid by the Government to the official receiver. Several of the contractor's other creditors, who were not interested in the undertaking for the inclined way, opposed the demand and maintained that this law did not apply; firstly, because there was a bankruptcy; secondly, because prior to the bankruptcy those creditors claiming preference did not enter a preferential claim against the outstanding balance, and did not attach it; and, lastly, because the funds had been paid to the official receiver, who acted as representative of the bankrupt contractor.

This dispute was submitted to the judgment of the three degrees of jurisdiction established in Belgium.

The Antwerp Tribunal of Commerce first, and the Brussels Court of Appeal afterwards, decided that the workmen and the suppliers had under the law of pluviose an exclusive right against the money owing by the Government in respect of the undertaking, on which they had co-operated, so long as it remained unpaid, and that the official receiver in his capacity as liquidator of the contractor's liabilities received the residue of the undertaking's price subject to the formal and special provisions of the law of Pluviose. The Belgian Court of Cassation ratified by its supreme authority those decisions on the application and the interpretation of this law.

3. Concerning Building-Owner's Right to Cancel Contract in Certain Circumstances.

Alongside of those two marked advantages the Belgian Law contains some great inconveniences for the contractors.

In consequence of an article of the Civil

Code the building owner has the right of cancelling at will a contract for a lump sum.

This provision derogates from one of the fundamental principles of law, *i.e.*, the compulsory force of a contract, as thus declared in an another article of the Civil Code: "Contracts lawfully made take the place of the law for those who have made them; they cannot be revoked except by mutual consent or for reasons authorised by law; they must be carried out in good faith."

In the first-mentioned article the Civil Code modifies this latter fundamental article. A simple act of will on the part of the building owner, whatever may be the motive, is sufficient to suppress the compulsory force of the contract for the undertaking. The contractor cannot prevent this, neither on this point have the courts power to consider the motives of the building-owner. It is enough for the latter to affirm positively his will to cancel the contract to make the cancellation binding on the contractor and on the courts. The manifestation of this will may be made at any time, before beginning the works as well as pending their progress.

This exorbitant power granted to the building-owner needed an important corrective. In the measure of possibility it was necessary to prevent the owner acting by caprice or in bad faith. Therefore, the Civil Code adds that the owner who makes use of his right of cancellation at will must indemnify the contractor (1) for all his expenses, (2) for all his works executed, and (3) for all the profits he might have made out of the undertaking.

The obligation to indemnify the contractor will cause the building-owner to think twice before acting in that way. The wide and general words used by the law to enumerate the elements of damages to be contained in the drawing-up of the statement of damages include all causes whatsoever of indemnity in relation to the undertaking thus cancelled.

Thus the words "all his expenses" comprise all preliminary expenses as well as subsequent expenses made by the contractor in view of the undertaking: studies, sounding of ground, correspondence, wages of employees and workmen, purchases of materials and plant, capital engaged, cost of survey, insurances, etc.

Similarly, the words "all his works" contain the necessary preparatory works—for instance, draining of the site, bringing to it the requisite water for the uses of the work, construction of approach ways, etc. These words apply likewise to works realising the immediate object of the undertaking, such as piles, masonry in foundations and above ground, beams, girders, anchorages, etc.

Lastly, the words "all the profits he might have made out of the undertaking" mean that without any distinction all that in the carrying out of the undertaking may yield to the contractor any profit shall be paid by the owner. Those wide expressions comprise also the moral damage arising out of the injury to the professional standing and commercial and industrial reputation of the contractor, as well as profits on materials, on plant, on wages, on capital, etc.

A first important remark ought to be made. If the owner may cancel the contract by his own will, the law declares that he may only do so on indemnifying the contractor. That means that the contract is cancelled in exchange for damages. In other words, it is only after having been paid the damages caused by the building-owner's action that the contractor ought to suffer the cancellation of the contract, deliver the work such as it stands, and disappear from the site. Until then the contract is suspended in this sense—that the contractor is no longer bound to keep on with the work; but until that time also the contract remains in force, in this sense—that the contractor retains possession of the property and also keeps the risks of the work. He is bound to carry out his obligation of yielding up the site and the works, but only in return for payment of all owing to him. He has the right to detain the property until the day of this payment.

A second observation is that those damages arising out of the cancellation of the contract of undertaking are protected and secured by the lien law analysed in sect. 1. So that if the contractor before beginning the works has taken the wise precaution of proceeding to the first valuation and to its recording, he may in case of cancellation have recourse to the second valuation and its recording. The use by the owner of his right of cancelling is tantamount to an affirmation that the works are finished. Consequently the surplus value added to the property by the works is available as subject to the contractor's lien; it may and ought to be estimated on the day the owner uses his right of cancellation.

It will be at once evident how considerable is the defence that the contractor has against the caprice or the bad faith of the building-owner. The recording of the contractor's privilege tends to induce the cancelling owner to settle quickly the account for damages, since he is interested in freeing his property from the recorded claim. The contractor is and remains over against the owner a privileged creditor for the whole amount of his claim, and he is only bound to authorise the cancellation of the inscription on the record of mortgages after payment of the last farthing of the whole sum owing to him. A variation of the privileged right of the contractor to the above-mentioned surplus value takes place in respect of the claims of the other creditors of the owner, and takes effect when, seeing the impossibility of the owner paying his debts, the property charged with the privilege has to be sold, and the proceeds thereof then fall to be divided among the creditors according to rank.

A third remark is that the article of the Civil Code limits the owner's right of cancellation to agreements for a definite fixed price. But legal writers admit and teach that the owner has the same right when the work has been undertaken for measure and value.

A fourth remark is that the right of cancelling is reserved to the owner against the contractor, and that the latter has not the same right against subcontractors to whom he may have entrusted a part of the principal undertaking.

4. Concerning the Determination of a Contract in the Event of the Death of the Contractor.

The second inconvenience for contractors is created by another article of the Belgian Civil Code, which declares cancelled by the contractor's death a contract for the letting of work (such is in Belgium the generic legal name of the undertaking contract). This article applies to both the parties, and is a derogation of the principle that heirs are bound by the debts of their author. The reason thereof is that the personal character of the contractor is one of the main motives of the undertaking agreement. And indeed the personal ability, professional skill, honesty, punctuality, solvency, and reputation of the contractor are determining reasons in causing the owner to contract.

The general imperative terms of the law "declares cancelled" seem to imply an effect produced inevitably by the death of the contractor. That is not so. The article of the code gives to the owner and to the heirs of the contractor a choice. Consequently there ought to be on one side or on the other an obvious manifestation of intention. Without that the undertaking agreement goes on, and the works are finished by the contractor's heirs or by their representative on their account. This is, after all, what happens usually.

If one of the parties bound by the contract chooses cancellation the owner has to pay to the contractor's succession the value of the executed works and the prepared materials in proportion to the agreed price, but only when these works and materials may be useful to him.

The obligation of the owner in this case is consequently determined in other manner than that of the owner who cancels the contract by his own will. The reason of this difference is simple. The law considers the contractor's death as some sort of fortuitous event giving rise to settlement of the accounts of undertaking, but not to damages. What returns to the contractor's heir is an amount proportioned to the undertaking price—that is to say, an amount to be calculated by a valuation or a comparison between the agreed price and the value of the executed part of the work. When the death happens after the contractor had already purchased the materials and plant after he had carried out the preparatory works, the return to the contractor's succession ought to be estimated according to the usefulness the purchase of materials and plant and the preparatory works may have created for the owner.

The text of the law which determines the claim of the contractor's heirs speaks of works and materials which may be useful to the owner. The word "useful" should not be understood in its ordinary sense, and limited in consequence to the obligation of the owner to pay for the works which yield a pecuniary profit, for the undertaking may have as its exclusive object an expenditure on luxury, such as decoration, ornamentation, carving, which afford to the owner in the shape of æsthetic satisfaction all that he would obtain from the contract.

It is proper to point out that cancellation of the undertaking and payment of the claim of the contractor's heir are intimately connected, and that the cancellation becomes complete only after payment of the amount due to the contractor's succession. Until then the heirs are entitled to retain the works and the site.

We may understand also all the advantage the heirs may get from the situation, when the contractor has taken the precaution to secure his privilege. Because the legal cancellation of the undertaking stops the works and fixes the rights of both parties on the day of the death, and consequently the second valuation defining the surplus value arising out of the works done up to then may be drawn up and recorded.

THE PROPERTIES OF LIMES AND PLASTERS.—I.

In the rush of modern construction those responsible for building are apt to spend but little time upon assessing the properties of their materials, often relying wholly on the standing and integrity of the firms which supply the "food" of the building trades, and many is the man who will state that he does not believe in the tests of the scientist, but prefers his own judgment based on general experience. Such an individual has probably been more fortunate than wise, for though serious troubles due to faulty materials perhaps come seldom, when they do come they are usually far-reaching in character. Now, a brick or a piece of stone or timber can be judged to a very large degree by mere inspection by any experienced person, and there is, therefore, some excuse for the attitude referred to in dealing with such substances; but when a material is presented in powder the opportunities for adulteration are so greatly increased, and the scope for tests applicable to solids in large pieces are so appreciably reduced, that no apology seems necessary for setting out the principles which underlie the proper manufacture and use of limes and plasters with which it is proposed to deal in this and following articles.

Although the expression "plaster" is used to cover a great many different substances, the term will be employed here in the more modern and restricted sense to indicate materials which have as their essential basis sulphate of lime. This definition excludes ordinary three-coat work, the composition of which will be dealt with under "Limes."

Sulphate of lime is found in transparent, well-shaped crystals known as selenite, which are common in the London clay, and are known by the clay-workers as "petrified water," but is found to a much larger extent as gypsum, which, though it has the same composition, is very different in appearance, being usually found in white masses, often showing a fibrous, silky texture. This mineral is the source of all the important plasters, such as Serapite, Keene's and Parian cements, and plaster of Paris. It is found in a remarkable state of purity for a material mined on a large scale, but is associated with small quantities of carbonate of lime, silica, magnesia, alumina, and iron. The last-mentioned is detrimental to the colour of the material, giving it a pinkish tinge.

The process of manufacture is a simple one, and consists of crushing and grinding the mineral, which is not hard, but has a peculiar toughness due to its fibrous nature, and then

heating it to expel not only moisture but water present as an essential in its composition.

As an understanding of all materials which "set" is impossible without an appreciation of this "water of crystallisation," as it is termed, a few words on this subject are essential. Many mineral and prepared chemical substances when deposited in the solid form by evaporation of a solution of such bodies in water appear in regular forms with bright flat faces, making definite angles with one another—crystallised sugar is a familiar example—and in many but by no means all cases the substance in crystallising takes up water, not as a liquid entangled in its pores, but as a part of its composition, definite in amount and essential to its shape and many of its other properties. Such "water of crystallisation" combined with the compound in a solid condition is usually expelled fairly easily by heat, when the substance loses its regular shape and falls to powder. In some cases the whole of this water is equally readily expelled, but in others the last portion of it is so firmly held to the rest of the material that it can only be removed at a high temperature or by complete decomposition of the substance proper. When a material which has this tendency to combine with water is deprived of it—that is, dehydrated—it usually tends to absorb water when mixed therewith or placed in a moist atmosphere; and, if the amount of water is sufficient, this absorption will be attended by a recrystallisation of the material, a very important feature of this process being the increase of bulk with which this is generally accompanied. The above facts form the basis of the usually accepted theory of the "setting" of plasters, limes, and cements, and, though the explanation is not universally accepted for the last two classes, it is so as far as plasters are concerned.

To return to the formation of plasters from gypsum. After the mineral has been ground it is heated to a temperature somewhat above that of boiling water, namely, to between 330 deg. Fahr. and 395 deg. Fahr., which must be carefully regulated, because the operation is designed to expel not the whole but only three-quarters of the water of crystallisation contained. Chemically gypsum consists of calcium (a metal), sulphur, oxygen, and water, and is represented by the formula $CaSO_4 2H_2O$, and the expulsion of water as follows:—

$$2\,(CaSO_4 2H_2O) = \begin{matrix} CaSO_4 \\ CaSO_4 \end{matrix} > H_2O + 3H_2O \text{ (water expelled)},$$

and the substance formed is known as plaster of Paris.

The operation is conducted usually in large iron cylindrical vessels, known as "kettles," which hold six to as much as twelve tons of gypsum, the larger sizes being some 8 ft. high and 10 ft. in diameter. Heat is applied gradually while the material is fed in, and, as much moisture is always present (apart from the water of crystallisation), the material becomes liquid and boils at a temperature but a few degrees above that of water. When this moisture has been expelled the substance settles down and becomes solid, but boils again as the temperature rises and the combined water is removed. When three-quarters of the combined water have been expelled, the liquid is allowed to run out and solidifies as plaster of Paris. Sometimes rotary plants are used somewhat similar to those employed for cement making, but on a smaller scale, in which case the grinding generally follows the calcining process.

What has been said above refers strictly to the treatment of very pure forms of gypsum, but for many purposes plaster of Paris thus formed is too brittle and quick-setting, and for wall surfaces gypsum containing some natural impurities which modify the properties of the plaster is employed or ingredients in very small quantities are added. To decrease the rate of setting, powdered glue or other organic substance, to the extent of a few pounds per ton, is usually added, which is best done after the gypsum has been calcined and cooled, with the aid of a mechanical mixer.

Keene's Cement.

Among the many hard plasters formed by adding ingredients to burnt gypsum, Keene's cement may be cited as by far the most important. In this case the mineral is heated in small kilns to a red heat, being thus deprived of all its water of crystallisation, and a very pure gypsum is required for this manufacture. The lumps of calcined mineral are then immersed in a solution of ordinary alum (about ten parts of alum to ninety of water), dried and again heated to redness, when it is cooled and finely ground. Keene's cement (which should be called "Keene's plaster," for cements belong to a different category) sets comparatively slowly, and until nearly hard can be knocked up again and re-used without detriment, a fact which is not generally recognised, and might often be taken advantage of when errors or alterations occur and the necessary changes can be made while the work is still "green."

Flooring Plasters.

Considerable use has been made in Germany, though not much elsewhere, of the fact that gypsum when heated to a temperature above 400 deg. Fahr. and ground, forms, when mixed with water, a plaster which sets slowly but develops great hardness, so much so that it can be used as a flooring surface. The usual belief is that if gypsum be heated until the whole of its water of crystallisation is expelled, it becomes "dead burnt," and is incapable of setting at all on the addition of water. But the true facts appear to be that if gypsum is heated for a limited time to a moderate temperature, say, 400 deg. Fahr. to 500 deg. Fahr., although the whole of its water is expelled it will set with water slowly to a very hard solid, but should the heating be very long continued or performed at a very high temperature it really does become "dead burnt," and will not then set at all.

Flooring plasters should be used on a good foundation, which will allow them to dry evenly, and must not be exposed to moisture when hardening. Properly laid they form a very durable surface. They may be used mixed with inert aggregates, such as sand, but only with a degradation in quality in proportion to such aggregate added.

Properties of Plasters.

But little difference will be apparent in the general appearance of many plasters in the state of powder, though freedom from colour is an obvious quality to be sought for many uses. The presence of glue or other organic "retarder" may be surmised by heating a little of the material by means of a smokeless flame upon, say, a piece of clean sheet-iron, when the charring of such matter will produce a greyish tint in the powder. Similarly any iron compounds will, under a like test, produce a pinkish tinge due to the formation of red oxide of iron. As the actual compositions vary so slightly, analysis by an expert chemist is required to detect most other possible ingredients.

In the case of Portland cement, specific gravity—that is, the weight of the material, bulk for bulk, as compared with water—is, of course, a most valuable guide to its character, and, though tests are seldom made on plasters, it may be useful to state that the true specific gravity of plaster of Paris is about 2·57 (*i.e.*, it is very slightly more than two and a half times as heavy as water), and as measured in powdered, in the manner which would be adopted in using a cube foot box after the style of the old "striked bushel," the specific gravity is about 1·8 or 113 lb. per cubic foot. These figures will vary but very slightly for all the true plasters which will be described.

As to fineness, if 70 per cent. of the plaster pass through a sieve containing seventy-four holes per lineal inch, or 50 per cent. through a 200-hole sieve, the result may be regarded as satisfactory. In making this test it is hardly necessary to point out that the sieve and material must be carefully dried to prevent any clogging.

The strength of plasters is not a subject which usually receives any attention, but the following summary of facts culled from experiments should be of value:—

Plasters attain almost their full strength after about a week from laying, but the increase takes place slowly up to about a month. When mixed with inert material such as sand, the strength added after a week is much less than when they are used neat.

The tensile strength of neat plaster may be as much as 400 lb. to 500 lb. per square inch. Sand much reduces this strength, and plaster and sand 1 to 3 may have but little more tensile strength than 100 lb. per square inch. The adhesive strength of neat plasters to a smooth brick surface should be about 60 lb. to 80 lb. per square inch after a week, increasing to something over 100 lb. in a month.

ELECTRIC LIFTS.

MR. H. MARRYAT, M.Inst.E.E., read a paper on "Electric Lifts" at a meeting of the Association of Supervising Electricians on December 14, in the course of which he said:—

"I propose to deal only with the usual types of lifts found in domestic and business premises in London, to indicate the chief points which go to distinguish a good lift from a bad one, and to give you a few practical hints upon upkeep and maintenance.

It is only in the case of service lifts, where no person can travel with the lift, that the factor of safety both as regards the strength of materials and number of safety devices can be properly reduced. No matter for what purpose the lift may have been constructed—it may be for conveying coal, or flour, or what not—if the car is large enough for persons to travel by, then sooner or later it will be used for that purpose. Bearing this in mind, all such lifts should be constructed to be as safe as the ordinary passenger lift. When a lift is constructed without this full margin of safety, then the car should be either too small for a person to enter or so fitted with fixed shelves as to make this equally impossible. My experience is that no form of notice or warning is sufficient to prevent a man risking his life if it will save him a little stair or ladder work.

Leaving on one side a number of special and eccentric designs, and taking no account of an equal number of monstrosities, lifts may be broadly divided into two classes—that is to say, sheave-driving lifts and drum-driving lifts.

Each of these classes may be again divided into top-gear lifts and bottom-gear lifts—that is to say, lifts in which the gear is situated

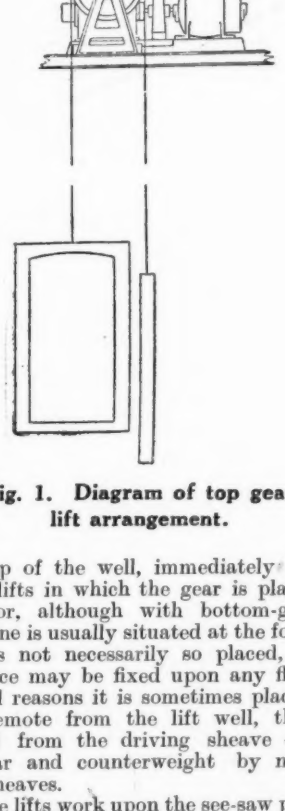


Fig. 1. Diagram of top gear lift arrangement.

at the top of the well, immediately over the car, and lifts in which the gear is placed elsewhere; for, although with bottom-gear lifts the machine is usually situated at the foot of the well, it is not necessarily so placed, but for convenience may be fixed upon any floor, and for special reasons it is sometimes placed more or less remote from the lift well, the ropes being led from the driving sheave or drum to the car and counterweight by means of guiding sheaves.

All these lifts work upon the see-saw principle. Not only are the car and the attendant, if any, fully counterweighted, but also a proportion—usually 40 per cent.—of the maximum load. Under these conditions, the lift descending empty will take almost as much power as when ascending fully loaded, and exactly the

same power as when ascending with 80 per cent. of full lead. On the other hand, with an average load of 40 per cent. of full load it will take practically no power either ascending or descending. It is this system of counterbalancing part of the load which secures for the electric lift its extraordinary efficiency.

Comparing electric with hydraulic lifts, the first cost is very much the same. A completely automatic electric lift may cost a little more than an ordinary hydraulic lift, but no attendant is required with the automatic lift, whilst one is needed in the other case. In the running costs there is little ground for comparison; the electric lift, properly constructed, costs less all the time. With a hydraulic lift the quantity of water used is the same whether the car be fully loaded or quite empty—in fact, no matter what the load may be; but, as we have seen, an electric lift will carry its average load at practically no cost.

Mr. H. C. Crews, M.Inst.E.E., in a paper read in 1906, analysed the energy cost of a large number of electric and hydraulic lifts. The conclusion he arrived at showed that electric lifts cost less than a quarter as much to run as did similar hydraulic lifts. Some of his examples, taken separately, showed more favourable results, and my own experience is that modern electric lifts cost for electric current about one-tenth of the water bill for similar hydraulic examples. When carefully balanced the energy for starting and accelerating an electric lift exceeds that of the actual running, so that a skilled attendant will effect great economy over an unskilled one, who will sometimes make two or three shots before attaining floor level. In this respect a push-button automatic lift gives a maximum of economy, because it only makes one start for each journey and automatically finds its own floor level.

We have a very useful practice in my own firm, which I have never noticed elsewhere, of applying counters to the controllers. These counters register the number of journeys made—that is to say, the number of times the motor is started and stopped. With an automatic lift each journey must be at least the distance from one floor to another, and will average about half the full travel of the lift.

As further corroboration of the extraordinarily low running cost of electric lifts, the Chief Engineer of the Westminster Electric Lighting Company informs me that in respect of fifty electric lifts operating in their district, the current consumption for the past twelve months has been 53,000 units, or only 1,060 units per lift per annum. The car lights, taking a considerable amount of energy, are usually included with the energy cost for the lift.

With regard to the important item of maintenance cost, the balance is again in favour of the electric lift. A hand-rope or car-switch lift operated by an attendant, which is the only type of lift which may be fairly compared with a hydraulic lift, will cost 25 per cent. less to maintain than its hydraulic equivalent. A completely automatic electric lift will cost no more to maintain than a hydraulic one, with the additional economy of the attendant's salary, which in itself will be about five times the total maintenance cost. When a hydraulic lift has to be taken out of a building for any reason its scrap price will hardly pay for the cost of removal, whereas, on the contrary, in the case of an electric lift there is no difficulty in adapting it for another position. If I have seemed to dwell rather long upon this matter of comparison between electric and hydraulic lifts, it is because many of you must be frequently asked to express an opinion on this very question, in which case I hope you will find these facts and figures useful.

A matter which is very distinctly within the province of the supervising engineer is the adjustment of lift counterweights. As supplied by the makers, the counterweight consists of a wrought or cast iron frame made up to about equal the weight of the car, and a number of cast-iron slips with which a suitable balance to the average load may be made up.

The manufacturer, not knowing what the average load is going to be, has only the maximum load specified in the contract to guide him, and he usually assumes the average load to be 40 per cent. of full load, and balances accordingly. After the lift has been got to work for some time this estimate may prove to be quite wrong. The owners, in their anxiety to be on the right side, may have specified a maximum far in excess of probable requirements, or, for the sake of economy, they may have specified it so low that the average load carried is very nearly the maximum the lift is designed for. This often happens in the case of goods lifts.

Let us suppose that two quite similar lifts have been erected, but that one is balanced for a maximum load of 5 cwt.—that is to say, 2 cwt. of load counterbalanced—and that the other is balanced for a maximum load of 20 cwt., in which case 8 cwt. of load would be balanced Now, it is quite possible that the actual average load in both cases will be that of two persons, or, say, 250 lb. The 20 cwt. lift will cost practically nothing to take its two passengers up, as current will only be required to release the brake and start the machine. The counterweight then takes control and does the rest. On the downward journey, however, provided the two passengers are so kind as to use the lift, 896 lb. of counterweight must be raised against a load of 250 lb., making a nett weight of 646 lb. to be raised. If the passengers prefer to walk down instead of using the lift, as they sometimes do, the weight to be raised before the car is at the ground floor ready for the next trip is 896 lb. Taking the up and down journeys together, the average work done

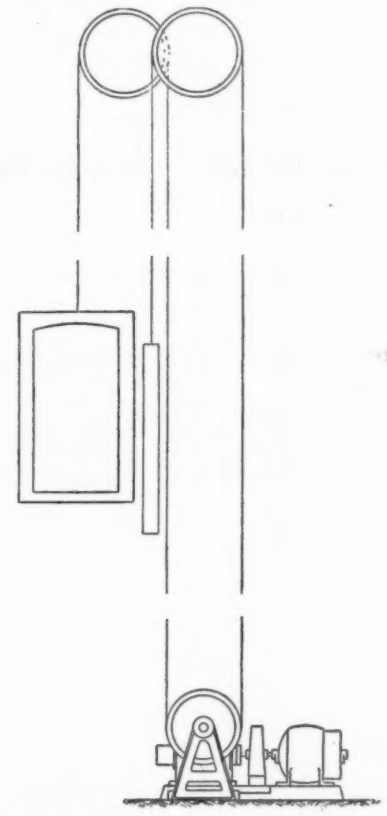


Fig. 2. Diagram of bottom gear lift arrangement.

is equivalent to raising 323 lb. if the passengers use the lift coming down and 448 lb. if they do not.

Compare these figures with the results obtained from the other lift. In this case the difference between weight of counterbalance and the actual average load is only 36 lb., the load consisting of two persons being the heavier. On the upward journey 36 lb. has to be raised, and on the downward journey the load will take control, and practically no current will be drawn from the mains. If the passengers elect to walk down, 224 lb. has to be raised to bring the car to the ground floor. Taking the up and down journeys together again, we find that the work done is equivalent to 18 lb. raised in the one instance and 121 lb. in the other. So that if the passengers use the lift on the downward journey the current consumption of the lift balanced for 20 cwt. maximum load will be eighteen times as much as the other, and if they walk down it will be four times as much. The result of a day's work upon these two lifts will show that the one has run the meter up about ten times as much as the other.

You may accuse me of having taken an extreme case. I have done so purposely to prove the principle which is true of all lifts, and I can point to actual economies of 50 per cent. and upwards which have been effected by attention to the correct counterweighting of lifts to the average load, which, it must be remembered, is a factor which can only be discovered after the contractors have erected the lift and handed it over to the owners. In fact, it is a matter essentially for the supervising engineer to know something about, and to watch in the interest of his employers. The adjustment is effected by adding to or removing from the counterweight a suitable number of the cast-iron slips supplied with the lift by the makers. By adjusting the counterweight in this way to the average load the fact must not be overlooked that the maximum lifting power may be reduced; but this is frequently of small consequence compared with a large saving of the annual current bill. Before proceeding to describe the various parts which go to make a lift it will be well perhaps if I say a few words as to the relative advantages of top and bottom gear lifts.

Architects often exhibit a regrettable disregard for the requirements of the lift engineer, who frequently finds no adequate provision for placing the lift gear, and is often met with obstructions in the lift well, such as pipe-runs or set-offs in the brickwork, which might have been avoided, and which can only be circumvented with the greatest difficulty. The question of a pit—an essential if a lift is to serve the basement level—is frequently overlooked, and drains are run beneath the well, so that no proper pit can be constructed. The result is often a compromise, and a pit which should be 30 in. deep is reduced to 18 in., a condition which is unsatisfactory in the extreme, and often dangerous. For no other reason than the architect's oversight, many lift gears are fixed in positions involving considerable expense in installation and so much difficulty in subsequent maintenance that the work is never properly done.

The best place for a lift gear is at the top of the well, immediately over its work. Here the maximum of efficiency is attained and the number of parts to be maintained is reduced to a minimum. In this position the length of the ropes is only one-third that of the ropes for a similar lift, if the gear be fixed at the foot of the well. As rope renewals form the most expensive part of the upkeep of a good lift, this is a matter well worthy of consideration. A properly-constructed weather-proof room of ample dimensions and easily accessible should be provided in which to house the gear. If a top-gear lift is to serve the top floor, this house must be built upon the roof. The only objection to the gear being fixed at the top of the well arises from the possibility of noise and vibration being transmitted to the rest of the building. This difficulty should be met by good engineering and sound architecture. It is of primary importance that the lift gear should run noiselessly and free from vibration, and it is only upon the assumption that sufficient excellence in this direction is unobtainable that any argument can be found for placing the gear at the foot of the well, in which position a firm foundation and isolation from the rest of the building is more readily obtained. To prevent the transmission of noise and vibration to the building the bedplate may be anchored to a block of concrete of ample weight, which, in turn, is bedded upon sand and isolated from walls and footings by more sand. A thin cover of soft asphalt may conveniently be used to cover the sand surrounding the concrete bed.

In modern buildings of steel construction the difficulties arising from this source are greatly enhanced, and in such cases, supposing absolute quiet to be essential, every possible precaution must be taken to ensure that no rigid connection exists between the gear and the building."

The remainder of an extremely interesting paper, which we regret we have not space to give, was taken up by a description of the various parts of a lift, a subject for experts rather than architects.

BUILDING MATERIAL PRICES.

IN revising our prices for the first week of the New Year we thought it might interest our readers to give a table comparing these with the prices issued in our New Year's Number for 1915, thus showing at a glance the effect the war has had on the principal materials used in the building trades.

BRICKS, ETC.	Advance Price £ s. d.				Approximate Increase Per Cent.
Stocks Bricks	0	3	6	per 1,000	10
Fletton „	0	2	0	„	6
Thames Sand	0	0	9	per yard cube	10
„ Ballast	0	1	0	„ „	20
Portland Cement	0	8	0	per ton	21½
Blue Lias Lime	0	1	0	„	5
Grey Stone Lime	0	3	0	per yard cube	20
WOOD.					
Best Building Red—					
Deals	3	0	0	per standard	20
Battens	3	15	0	„	20
Scantlings	4	7	6	„	30
Joiners' Wood—					
White Sea First Quality Red:					
Deals 4 in., 3 in., 2 in by 11 in. or 9 in.	1	5	0	per standard	3¾
Battens 7 in. and 8 in.	0	12	6	„	2¾
Archangel White:					
Best 3 in. by 11 in.	6	15	0	„	31⅓
„ 3 in. by 9 in.	7	0	0	„	37
Prepared Floorings and Matchings—					
Second Swedish Red and Equal:					
1 in. by 7 in. Planed and Matched	0	3	0	per square	20
1¼ in. by 7 in. „ „	0	5	6	„	30
Hardwoods:					
Kauri Pine	0	1	0	per foot cube	15
Oak Logs	0	1	0	„	20
Dry Wainscot	0	0	1	per foot super. as 1 in.	10
Dry Walnut	0	0	1	„ „ „	10
Java Teak	1	0	0	per load	5
METALS.					
Joists, Girders, etc.—					
Rolled Steel Joists, ordinary sections	7	5	0	per ton	75
Compound Girders and Stanchions	6	10	0	„	50
Angles, Tees, etc	5	0	0	„	50
Cast-Iron Columns, etc.	4	10	0	„	50
Iron—					
Common Bars	6	10	0	per ton	75
Staffordshire Bars, etc.	6	15	0	„	75
Mild Steel	6	15	0	„	75
Hoop Iron	7	0	0	„	75
„ „ Galvanised	9	10	0	„	50
Sheet Iron—					
Black Sheets	5	15	0	per ton	50
Galvanised Sheets	9	0	0	„	55
Galvanised Corrugated Sheets	10	0	0	„	65
Cut Nails	5	0	0	„	40
LEAD, ETC.					
Sheets, Pipe Coils, etc.	12	10	0	per ton	50
Copper—					
Sheets, Nails, etc.	0	0	2	per pound	15
Oils, etc.					
Linseed, Raw and Boiled	0	1	8	per gallon	75
Turps	0	1	7	„	75
White Lead	13	0	0	per ton	45
Red Lead	13	0	0	„	45

PROPOSED NEW BUILDINGS AND OTHER WORKS.*

IN these lists care is taken to ensure the accuracy of the information given, but it may occasionally happen that, owing to building owners taking the responsibility of commencing work before plans are finally approved by the local authorities, "proposed" works, at the time of publication, have been actually commenced. Abbreviations:—T.C. for Town Council; U.D.C. for Urban District Council; R.D.C. for Rural District Council; E.C. for Education Committee; L.G.B. for Local Government Board; B.G. for Board of Guardians; L.C.C. for London County Council; B.C. for Borough Council; and P.C. for Parish Council.

Bedford.—Plans passed by the T.C.:—New workshop, for Wynward Cycle Company, St. Cuthbert's-street; iron roofs, for Mr. Atterbury, 2, Becket-street; iron roofs, for Mr. F. Corby, 62, Beaconsfield-street; lavatories, Electricity Works; covered shed for boiler, for Bedford Fire Brigade; and extensions, lavatories, etc., for Mr. J. A. Hague, Mill-street.

Bentley.—The L.G.B. has held an inquiry into the application by the U.D.C. for permission to prepare a town-planning scheme.

Bradford (Wilts).—Approval has been given to plans by Mr. W. T. Marsh for the conversion of No. 1, Trowbridge-road into two houses.

Exhall and Foleshill.—The directors of the L. and N.W. Railway Company have in contemplation the carrying out of an important scheme for extensions of siding accommodation on their Nuneaton and Coventry branch at the Hawkesbury-lane and Longford and Exhall stations.

Finchley.—Plans passed by the D.C.:—Additions, "Homewood," Cyprus-avenue, Mr. A. H. Hale; four houses, Lyndhurst-gardens, Mr. J. C. Williamson; soil and surface-water sewers, Ringway, connected with Addison-way, Co-partnership Tenants, Ltd.; motor garage, etc., Westbury-road, Mr. A. Pirie; motor garage, "Laleham," Dollis-avenue, Mr. W. M. Shanley; three houses, Fallowcourt-avenue, Mr. A. Dowdall.

Glasgow.—At Glasgow Dean of Guild Court recently linings were granted to Messrs. Carsons, Ltd., chocolate manufacturers, 49, Solway-street, to add to their works there; Messrs. J. & T. Boyd, Ltd., engineers, to extend their premises in Old Shettleston-road; the Glasgow Eastern Co-operative Society, Ltd., 34, Dalmarnock-road, to alter buildings in Westmuir-street.

Halifax.—At a recent meeting of the T.C. the Council was asked to apply to the L.G.B. for their sanction to the Corporation borrowing £5,558, the additional cost in connection with the purchase of plant required for the electricity works. Also to sanction a proposal by the Waterworks Committee to lay 550 yds. of main from Mixenden Reservoir to the works of Mr. J. W. Bulmer, Hays Mill, Mixenden, at an estimated cost of £500. The Improvement Committee have resolved that the Town Planning Sub-committee be appointed to confer with the Sub-committee appointed by the Health Committee on the question of a housing scheme and report.

Hendon.—The Town Planning and Building Applications Committee has given its approval to the following:—Cottage flats, Erskine-hill, Mr. A. F. Garrow; house, Rotherwick-road, Mr. F. W. Bristow; boiler house, Renters-avenue, Hendon, Messrs. Johnson's Manufacturing Chemists; hangar, Booth-road, London and Provincial Aviation Company; out-buildings, Schweppes' Factory, Hendon, Messrs. Schweppes; additions, Hendon Hall, Hendon Hall, Ltd.; motor house, 1, Goodwyn-avenue, Mill-hill, Mr. E. J. Clarkson; tool and bin house, Meadway-court, Co-Partnership Tenants, Ltd.

Henley.—The Council has passed plans for motor garage in Rivermead-road, for Messrs. Hobbs & Sons, Ltd.

Leamington.—Alterations and additions are to be made to the Warneford and South Warwickshire Hospital, Leamington, to provide fresh accommodation for the X-ray and electrical department, which is at present at the basement of the premises. The present nurses' sitting-room is to be converted into the new X-ray department, and a new nurses' wing is to be built. The annexe to the nurses' home will cost £900, and the X-ray and electrical installation £300.

Malvern.—At a recent meeting of Worcester E.C., held to consider what accommodation should be secured for Worcester children in the open-air school at Malvern, it was reported that guarantees had been given by city gentlemen to the amount of £500, to provide an extension of the school.

Manchester.—The City Council propose to spend £79,000 on new works at Longdendale, to afford protection from damage through floods, and to increase the storage capacity of the reservoirs. The Trafford Park Estates, Ltd., propose to construct light railways from Trafford Park to Lostock, passing through the parish of Davyhulme and the urban district of Stretford.

Mutford and Lothingland.—The R.D.C. has accepted an estimate for certain drainage work at Bradwell.

* See also our list of Competitions Contracts, etc., on page 38.

Newcastle.—The Town Improvement Committee has approved plans for the erection of a new picture hall in Back-street, Newcastle.

New Zealand.—H.M. Trade Commissioner in New Zealand has forwarded extracts from the local Press, from which the following particulars are taken:—The ratepayers of Auckland have authorised the municipal authorities to raise a loan of £115,000 for the purpose of carrying out the following works:—Erection and equipment of market buildings, £55,000; establishment of a fish market, £20,000; water supply in Grey Lynn, £10,000; construction of drainage works at Remura, £30,000.

Northampton.—The T.C. has approved plans of three new houses (King Edward-road and Cedar-road).

Ripon.—The City Council has decided to proceed with the erection of six additional fresh water baths at the Spa Baths, costing £250.

Ruskington.—The U.D.C. has passed a plan for a new dairy (Mr. W. H. Silson, Manor-street).

St. Germans.—The R.D.C. has passed plans for a bungalow at Anderton, for Miss Llewellin.

St. Ives (Cornwall).—The T.C. has approved of a plan presented on behalf of the Salvation Army of premises proposed to be erected at the New Pier.

Southend.—Plans approved by the T.C.:—One bungalow, Marguerite-drive, Mr. T. W. Cook; one bungalow, Hamstel-road, Mr. J. J. Going; three houses, North-avenue, Mr. F. H. Farnborough; house, stable, and cowshed, Southbourne-grove, Mr. T. Coates; alterations and additions, 40, Prittlewell-street, Mr. C. Floyd; one bungalow, Blenheim-crescent, Mr. S. Sharp; two bungalows, Marguerite-drive, Mr S. C. Arnold; alterations, "Mornington," Drake-road, Mr. P. J. Hobbs; additions, "Clovelly," Fermoy-road, Mr. T. Blackall; lantern loft, church of St. Paul, Summercourt-road, Rev. A. Waller; two bungalows, Leigh Hall-road, Mr. H. Bridge; alterations to roof, 44, Clarence-road, Messrs. Tolhurst & Cozens; roadway off East-street, Great Eastern Railway Company.

Staines.—The R.D.C. has approved a plan from Mr. Evans, of Cranford, for two cottages in Tentlow-lane, Cranford.

Sunderland.—A plan has been approved by the Corporation for the building at Holmeside of a block of seven shops, with billiard-rooms above and at the back. They are to be erected for a Newcastle firm having billiard saloons in several centres in the north-east district.

Uxbridge.—The U.D.C. has approved plans for flour store at 3, Cowley-road, for Mrs. F. Davis.

York.—The Streets and Buildings Committee of the York Corporation has approved of the following plans:—Mr. W. C. Oliver, temporary shed, Priory-street; Rev. P. J. Shaw, temporary shed, 28, Tanner-row; Mr. T. Morris, temporary shed, Escrick-street; Mr. A. Danby, temporary shed, 18, Hawthon-street; Yorkshire Insurance Company, Ltd., lavatory, St. Helen's-square; Mr. G. E. Barton, alterations to stables, 25, St. Mary's; Miss Milner, motor garage, Heworth Moor House, Heworth Green; Messrs. T. Cooke & Sons, Ltd., sheds, Cromwell-road; Mr. T. Belt, combined drainage, 28, 29, and 30, Charles-street.

GENERAL BUILDING NEWS.

EMPIRE, CARDIFF.

The Cardiff Empire has recently been opened after reconstruction. The front of the building in Queen-street is of Portland stone. The central openings lead into a porch, the walls of which are lined with Welsh marble, and then by a staircase to the waiting halls. The auditorium is divided into fauteuils, stalls, and pit stalls. Above is the grand circle, and above that the balcony and gallery. There are 1,200 tip-up chairs on the ground floor. There is accommodation in the grand circle for 500, seats for 570 in the balcony, and for 550 in the gallery. The private boxes occupy the usual side positions and extend right round the grand circle. Messrs. William & T. R. Milburn, Sunderland, are the architects, and Messrs. Turner & Sons, Cardiff, chief contractors.

NEWCASTLE-ON-TYNE CITY LUNATIC ASYLUM.

The last of the buildings forming the recent extension of the Newcastle City Lunatic Asylum has just been handed over. They comprise two villa blocks for forty patients each, nurses' home for fifty-six, and an isolation hospital for six patients. The villa blocks are built of brick walls faced with Lowry's Pensher pressed bricks; there is a half-inch cavity behind the outer facing filled in vertically with Callender's Bitubond. The walls of nurses' home and hospital are of stone; all the roofs are covered with Port Dinorwic slates, floors of Fawcett's Mon'lithcrete system, woodwork of deal and stained (part with Solignum); the plastering is of Victorite except the hospital, which is Albine cement; the ground floors are of pitch-pine boards and upper floors of deal blocks; heating is by hot water with radiators

RATES OF WAGES IN THE BUILDING TRADE.

THE following are the present rates of wages in the Building Trade in the principal towns of England and Wales. It must be understood that, while every endeavour is made to ensure accuracy, we cannot be responsible for errors that *may* occur:—

——	Masons.	Bricklayers.	Carpenters, Joiners.	Plasterers.	Slaters.	Plumbers.	Painters.	Masons' Labourers.	Bricklayers' Labourers.	Plasterers' Labourers.
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Aberdare	9	—	9½	9½	—	9	8	6½	6½	6½
Accrington	10	10	9½	9½	9	9	9½	6½	6½	6½
Altrincham	9½	10	10½	10	8½	10	9	6½	7	7
Ashton-under-Lyne	10½	10½	10	10½	9	10	9	6½	6½	7½
Barnsley	9½	9½	9½	9½	9	9	8½	7½	7½	7½
Barrow-in-Furness	9½	10	9½	9½	9½	9½	9	7	7	7
Barry	9½	9½	9½	10	—	9	8½	6½	6½	6½
Bath	8½	8½	8½	8	7½	8	7½	6	6	6
Bedford	8	8	8	8½	8	9	6½	5½	5½	6
Birkenhead	11	11	11	11½	11	11	9½	7	7	7
Birmingham	11½	11½	11½	10½	11½	11½	9½	8½	8½	8½
Bishop Auckland	9	9	9	9	10	9	7½	6	6	6½
Blackburn	10	10½	10	10	9½	10	9½	6½	7½	7½
Blackpool	10½	9½	9½	9½	8½	9½	8½	6	6	6
Bolton	10	10½	10	10½	10	10	9½	6–7	7	7
Bournemouth	8½	9	9	9	8½	9	8½	6½	6½	7
Bradford	10	10	9½	9½	10	10	8½	7	7	7
Bridgwater	6½	6½	6½	6½	6½	6½	6	4	4	4
Brighton	9	8½	8½	8½	—	8	7	6	6	6
Bristol	10½	10½	10½	10½	—	10½	9½	8	8	8
Burnley	10	10½	9½	9½	8	9½	9½	7	7	7½
Burton-on-Trent	9	9	9	9½	9	9	8½	6½	6½	6½
Bury	10½	10½	10	9	9½	10	9	6	7	7
Cambridge	9½	9	9	9½	9½	9½	7½	6	6	6
Canterbury	8½	8	8	10	—	8½–9	7	5	5	5
Cardiff	10½	10½	10½	10½	10½	10½	9½	7½	7½	7½
Chatham	8	9	9	9	9	9	7½	6	6	6
Chelmsford	8	7½	8½	9	—	7½	6½	5	5	6½
Cheltenham	8½	8½	8½	8½	—	8½	8½	6	6	6
Chester	9½	10	10	9½	9½	9½	8½	6½	7	6½
Chesterfield	9	9	9	8	9	8½	8½	5½	5½	5½
Colchester	8	8½	8½	9	8	9	6	5½	5½	5½
Coventry	10½	10½	10½	10½	9½	10½	9½	7½	7½	7½
Crewe	7½	8	7½	9	8½	8	7½	5½	5½	6
Darlington	9½	10	10	10½	10	9½	8½	7	7	7
Derby	9½	9½	9	9	9	9	8	6½	6½	7
Doncaster	9½	9½	9	9	9	9	8	6½	6½	7
Dudley	8½	8½	9	8½	8½	8	7½	5½	5½	6
Durham	9	9	9½	9	10	9	8½	6	6	6½
East Glam. and Mon. Valleys	10	10	10	10	—	—	9	7	7	7
Exeter	8	8½	8	8½	7½	7½	7	5½	5½	5½
Folkestone	8½	8½	8½	9	8½	8½	7–7½	6½	6½	6½
Gloucester	8	8½	8½	8	8	8½	8	5½	5½	5½
Grantham	8	8	7½	7½–8	7½–8	7	6½	5	5	5
Grays	—	10	10	—	—	9½	8½	7	7	7
Grimsby	9	9	9	9½	9	9	8½	7	7	7
Great Yarmouth	8	8	8	—	8	8	6½	5	5	—
Halifax	10	10	9½	8½	8½	9	8½	7	7	7
Harrogate	9½	9½	9	9	8	9½	8½	6½	6½	6½
Hartlepools	10	10½	10½	10½	10	10	9	7½	7½	8
Hastings	8½	8	8	8½	8	8	7	6½	5½	6½
Hereford	8	8	7½	8½	8	7	7	5½	5½	5½
Huddersfield	10	10	9½	9½	10	9	8½	7½	7½	7½
Hull	10½	10	10	10	10	10	9	8	8	8
Ipswich	8½	8½	8½	9	9	8½	7	5½	5½	5½
Lancaster	10	10	9	9	9	9	9	6	6	6½
Leamington Spa	9	9	9	8½	9	9	8	6	6	6
Leeds	10	10	10	10	10	10	8½	7½	7½	7½
Leicester	10½	10	10½	10½	10	10	9	7½	7½	7½
Lincoln	9	8½	8½	9	8½	8½	8	6	5½	6½
Liverpool	11	11	11	11	10½	11	9½	7	7	7
Llanelly	9½	9½	9½	8½	9	8½	8	5½	5½	5½
London	11½	11½	11½	11½	—	1s.	9	8	8	8
Loughborough	9	8½	8½	9	9	8½	7½	5½	5½	6½
Luton	9½	9	9	8½	9	8½	7½	6½	6½	6½
Maidstone	9	9	9	9	9	9	8	6	6	7½
Manchester	11	11	11	11	10	11	9½	7½	7½	7½
Mansfield	8½	9	8½	8½	—	8½	8	6	6	—
Merthyr Tydfil	9½	9½	9½	9½	8½	9	8	6½	6½	6½
Middlesbrough	10	10½	10½	10½	10	10	8½	7½	7½	8
Newcastle-on-Tyne	11	11	11	11	10	10	9½	7½	7½	7½
Newport, Mon.	10	10	10	10	8½	10	9	7	7	7
Northampton	9	9	9	9	8½	9	8	6	6	6
Norwich	8½	8½	8½	8½	8	8½	7½	6	6	6
Nottingham	10	10	10	10½	9½	10	9	7½	7½	8
Oldham	10½	10½	10½	10	9	10	9½	7	7	7½
Oxford	9½	9	9	9	8	9	8	6½	6½	6½
Plymouth	9	9	9	9	9	9	8	6½	6½	6½
Pontypridd	9½	9	9	9½	9	9	8	6½	6½	6½
Portsmouth	9½	9½	9½	9½	—	8½	7½	7	7	7
Preston	10½	10½	10	9½	9½	10	9½	6	7	7½
Reading	8½	9	9	9½	—	9	7½	6	6	6
Rochdale	10½	10½	10	10	8½	10	9	7	7	7½
Rochester	8	9	9	9	9	8½	7½	6	6	6
Rugby	9½	9½	9½	9½	8	9½	8½	6	6	6½
St. Albans	9	9	9	9–10	9	9–10	8	6½	6	6
St. Helens	9	9½	10	9½	9½	9½	9½	6	6½	6
Scarborough	9	9½	9	8½	8	9	8	7	7	7
Sheffield	10½	9½	10½	9½	10	10	9	7½	7½	7½
Shrewsbury	8½	8½	8½	9½	—	8½	7	5½	5½	5½
Southampton	8½	9½	9½	8½	—	9½	8½	6½	6½	6½
Southend-on-Sea	9	9	9	9	P'cework	9	7	6	6	6
Southport	10	10	9½	9½	9½	9½	9½	6½	7	7
South Shields	11	11	11	11	10	8½	9½	7½	7½	7½
Stockport	10½	10	10	10½	9½	10	9½	6	6½	7½
Stockton-on-Tees	10	10½	10½	10½	10	10	9	7½	7½	8
Stoke-on-Trent	9	9½	9	9	—	8½	8½	6	6	—
Stroud	7½	7½	7½	7½	7½	7½	7	5	5	5
Sunderland	11	11	11	10½	10	9	9½	7½	7½	7½
Swansea	9½	9½	9½	9½	8½	9	9	6½	6½	6½
Taunton	7	7	7	7	—	6	6½	4½	4½	4½
Torquay	8	8	8	8	8	8	8	6	6	6
Wakefield	9½	9½	9	9½	8½	9	8	7	7	7
Walsall	9½	9	9	9	8½	10	8	6½	6½	6½
Warrington	8½	10½	10½	10½	8½	10½	9½	6½	6½	6½
West Bromwich	10	10	10	10½	—	9	8	7	7	7
Wigan	10	10½	9½	9½	9	9½	9½	7	6	6
Windsor	9	9	9	10	—	9	—	6	6	6
Wolverhampton	9½	9½	9½	10	8	10	8	6½	6½	6½
Worcester	8½	9	9	9	9	9	7½	6	6	6
York	9½	9½	9	9½	9½	9	8½	7	7	7

The masons' rate given is for bankers; fixers usually ½d. per hour extra.

and pipes; the bathrooms, lavatories, and water closets have "Marmette" dadoes and floors of "Flintine" tiles; the stair steps and landings are of Yorkshire stone from Messrs. John F. Shackleton & Son, of Goole; internal partitions of Hemel Hempstead partition blocks; the upper windows of nurses' home have sashes hung on Hall's pivots. The general contractor was Mr. Alex. Pringle, of Gateshead, and the various subcontractors were:—Slating, Messrs. Beck & Son, Newcastle; plumbing, Messrs. Allinson & Son, Gateshead; plastering, Mr. W. Ryan, Gateshead; painting, Messrs. Merrillees & Denton, Gateshead; heating engineers, the R. J. Ward Company, Newcastle; radiators and boilers, the National Radiator Company, Ltd., Hull; wood block floors, Messrs. E. Burgess & Co., Liverpool, and Turpins Floor Company, London; sanitary fittings, Messrs. Doulton & Co., Ltd., Paisley; fires and mantles, Messrs. Doulton & Co., Ltd., Lambeth; Messrs. Emley & Sons, Ltd., Newcastle, and Messrs. Henry Walker & Son, Ltd., Newcastle; iron balusters and railings, Messrs. M. Aynsley & Sons, Ltd., Newcastle; locks and hardware, Messrs. N. F. Ramsey & Co., Newcastle; asphalt paths and roads, Mr. W. T. Wallace, Newcastle; mosaic dadoes, the Art Pavements and Decorations, Ltd., London; electric light, telephones, and telltales, Messrs. Robson & Coleman, Newcastle; boot lockers and racks, the Crittall Manufacturing Company, Braintree; fire hydrants, Messrs. J. Blakeborough & Sons, Brighouse; verandahs covering, Messrs. Pilkington's wired cast plate glass. The buildings were designed and the erection superintended by Mr. John W. Dyson, architect, Newcastle, with Mr. George Cousins as clerk of works. The whole Asylum has been taken over by the Military, and is now the Northumberland War Hospital.

TRADE NEWS.

St. Mary's Church, Berwick-on-Tweed, is being ventilated by means of Shorland's patent exhaust roof ventilators, supplied by Messrs. E. H. Shorland & Brother, Ltd., of Failsworth, Manchester. The East Cramlington P.M. Church and Schools, Northumberland, are being supplied with the firm's patent exhaust roof ventilators.

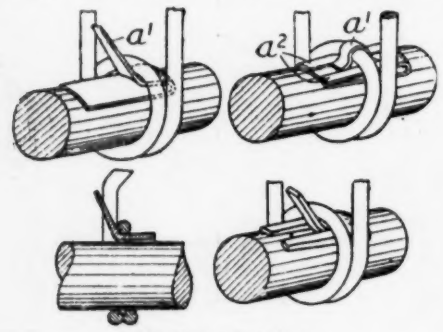
Messrs. Pilkington & Co., Polonceau and Seyssel Asphaltes, Deptford Wharf, 190 and 192, Creek-road, Deptford, S.E., have taken new offices at 17-18, Railway-approach, London Bridge, S.E., and they will be glad if all communications are sent to that address after the 18th inst.

We are informed that the lining of a 40,000 gallon reservoir in Bristol has been made perfectly watertight by the use of the waterproofed cement rendering Pudlo.

SELECTED PATENTS.

15,309 of 1914.—British Reinforced Concrete Engineering Company and Amos George Bullivant: Reinforced concrete.

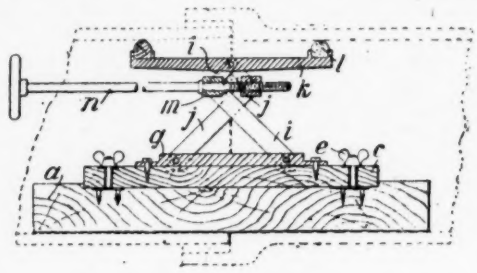
This relates to reinforced concrete in which stirrups or shear members are secured to the main bars by means of cotters passed between the bar and the loop of the stirrup and bent to prevent accidental withdrawal. The cotters may be formed by doubling a strip of metal; the tapered end a^1 is bent up after the cotter is driven in, but the central tongue a^1 or the two side tongues a^2 are bent up before being driven in and then bent down. A small cotter of tapering thickness may be provided, or a cotter of uniform thickness but tapering in width, the narrow end being bent up and the broad end curved transversely so that the edges bear on the bar.



15,309 of 1914.

15,332 of 1914.—Henry George Nicholson-Lailey: Pipe aligning instruments.

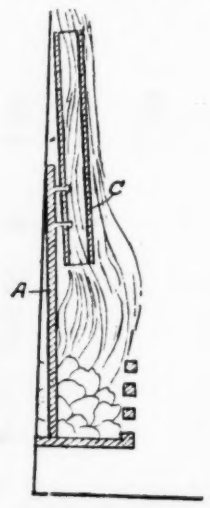
This relates to a device for aligning pipes comprising a base a adapted to extend across the joint, and a member k capable of slight rocking movement and adapted to be moved away from the base to bear against the upper inner surfaces of the pipes, so that true invert is secured and inequalities of the pipes are brought to the upper side. The member k, provided with projecting blocks I, is carried by two sets of toggle-levers i, j pivoted to a bar g secured to a plate c. This plate is detachably secured by wing-nuts e to a base a suited to the size of pipe, the under surface of the base being curved to fit approximately the inner surfaces of the pipes. The levers i, j are operated to produce relative movement of the parts a, k by a rod n passing through bushes m, one of which is threaded to work along a corresponding thread on the rod.



15,332 of 1914.

15,855 of 1914.—Alice Mary Chambers: Fireplaces.

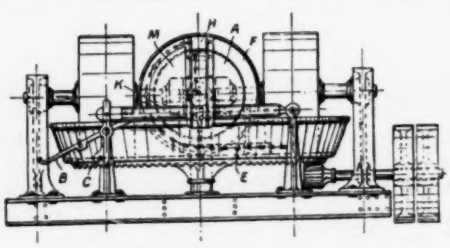
This relates to a device to prevent down-draught in open fireplaces, comprising a short length of metal piping C supported above the fire so as to be heated thereby. It may be attached to a prop A or to the back-plate of the fireplace, or otherwise supported, and may be formed with keyhole slots to take over fixed studs.



15,855 of 1914.

15,972 of 1914.—Edouard Van Montgau: Delivery devices for mortar mills.

This relates to delivery devices for mortar mills or mixing-machines operated by the rotation of the pan. Over the pan are mounted a rotary disc A with an annular channel F and a fixed plate M carrying blades E, H. The blade E directs the material into the channel F, which raises it to the blade H, by which it is directed to a shoot. The device is mounted on a pivoted frame K so that it can be lowered on to the pan, when the disc A is rotated by the motion thereof, or raised to put it out of action. The frame K can be held in its raised position by means of a lever B and pin C.



15,972 of 1914.

OBITUARY.

Lieut.-Colonel Greenwood.

The late Lieut.-Colonel Joseph F. Greenwood, of Bartram's Park, Hampstead, who died on December 27 at the Horse Guards, was an architect and a Fellow of the Surveyors' Institution. In April, 1907, he was appointed a Superintending Inspector of Works R.E. Staff, and in last August was gazetted honorary lieut.-colonel. In spite of increasing ill-health he remained at his post to the last. His eldest son, Lieut. J. F. B. Greenwood, 1st Royal Lancashire Regiment, fell at St. Julien, near Ypres, on May 3 last.

Lieut. E. K. Smith.

The death, on December 22 in Flanders, is announced of Second-Lieut. Ernest Kennedy Smith, aged twenty-three years, of the 1st East Kent Regiment, to which he was gazetted in last July. He was the eldest son of Mr. W. Macdonald Smith, of Onslow-gardens, Muswell Hill, and was educated at Dover College and Highgate School. He was a promising architect, and achieved high distinction in the Association Schools. He enlisted in September, 1914, and joined the Artists' Rifles.

Mr. W. J. Saville.

We regret to announce the death, which took place at Rugby a few days ago, at the age of fifty-six years, of Mr. Walter John Saville, who for many years had been associated with the firm of Messrs. Foster & Dicksee, builders and contractors. Mr. Saville was the Rugby manager and was also on the board of directors. He was a well-known surveyor. Until recently he was chairman of the Rugby Master Builders' Association and also chairman of the Rugby Benefit Building Society.

Mr. A. Hughes.

The death, on December 22, at his residence, East Side House, Kew Green, is announced of Mr. Arthur Hughes, aged eighty-three years, the last of the Pre-Raphaelite painters. In 1896 he entered the School of Design, in Somerset House, where his first master was Alfred Stevens, and a year later was admitted to the Royal Academy Schools. At the age of seventeen he sent his first picture, "Musidora," to the Royal Academy rooms, and three years afterwards his "Ophelia" was exhibited there, together with Holman Hunt's "Hireling Shepherd" and Millais' "Huguenot" and "Ophelia." His "Ophelia" was bought, upon Rossetti's instigation, by McCracken, of Belfast; for Mr. Plint he painted the "Nativity" (in the R.A., 1858), "Annunciation," and "Long Engagement"—which three pictures now belong to the Birmingham Corporation. With Rossetti, Morris, and Burne-Jones he shared in the decoration of the Union Society's rooms, Oxford, for which he painted, in tempera, the "Passing of Arthur" and the "Return of the Sword 'Excalibur' into the Lake"; in the Ashmolean Museum is his "Home from the Sea." Mr. Hughes was a constant contributor to the exhibition of the Royal Academy and the Grosvenor and New Galleries during a period of thirty years—to the first-named he sent, in 1856, a triptych, "The Eve of St. Agnes," as inspired by the poem of Keats; and shortly afterwards his "April Love," now in the Tate Gallery, Millbank. He illustrated the works of Christina Rossetti, the poems of William Allingham and George MacDonald, and Hughes's "Tom Brown's School Days." He received a Civil List pension three years ago. In 1855 he married Miss Tryphena Foord; his two sons and a nephew, Mr. E. R. Hughes, are artists.

Apotheosis of Marcus Aurelius: Relief from Ephesus.

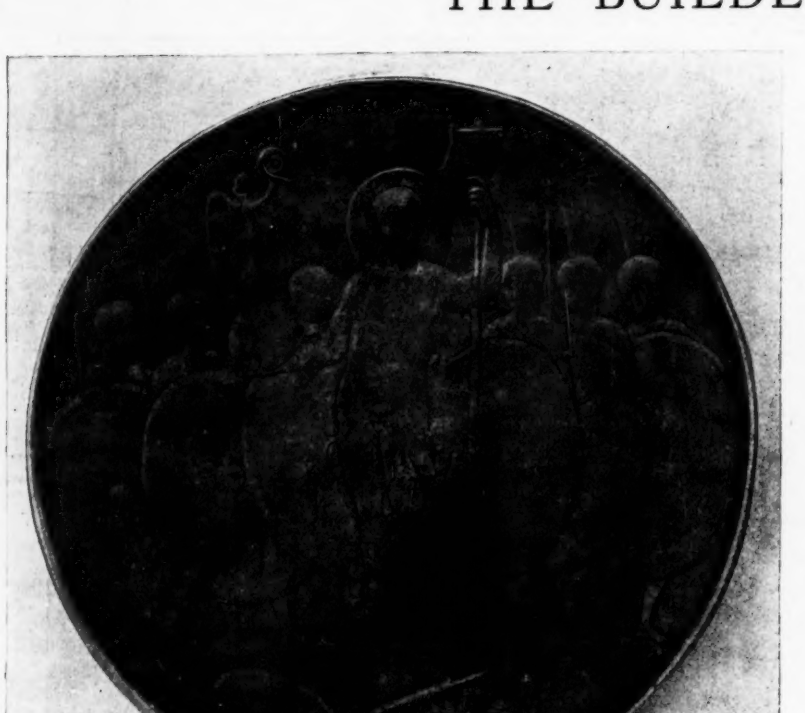
APOTHEOSIS AND AFTER LIFE.*

ROMAN art has come to its own at last; but it may safely be said that until now its connection with Roman religious beliefs, though foreshadowed by Della Seta, has never yet been exhaustively examined. Mrs. Strong, in her introductory address, criticises those students who would see in Roman art a mere local development under Oriental influences, by showing in the first place that from the time of Augustus Rome's position as a centre of artistic activity ranks her with Alexandria, Antioch, and Seleucia; in the next place that, as recent excavations show, Rome, long before the days of Augustus, was in possession of a vivid and distinctively national art, derived, it is true, from Ionia, but vigorous and independent nevertheless. Mrs. Strong protests in eloquent words against the folly of treating the Roman achievement as a foil to the Greek, and shows how both are but part of a great single movement, the antique. Greek art came to Rome not to die but to live, and to inspire the local Ionicised art with new life; and, with regard to the specific contribution of Rome to the antique, no conception of art which produced architecture of the highest order—the Pantheon, the Pont du Gard, the Baths of Caracalla and Diocletian—can be dismissed as second-rate or imitative. We may pride ourselves on the fact that England more than any other country has found inspiration for her own best work of the domestic and civic order in the study of Roman art. It was not for nothing that Chambers and the Brothers Adam worked in Italy, nor was there any antithesis felt between the work of Stewart and Revett on Athens and that of Adam on Diocletian's palace at Spalato. That great conception of the antique caused union among scholars, not division, until the fuller revelation of Greece caused Roman art to be looked on in the light of her worst features—those decorative copies of older works which have caused both Greece and Rome to become a weariness of the flesh to those who were taught to see in them the culmination and not the pale shadow of ancient art.

The unique position of the emperor restored to Roman art what had been lost in the greatest days of Greece—the importance of the central figure as a motive in art and architecture. The emperors, who had once modestly deprecated divine honours, accept the symbols of the gods from their own hands (Plate X.), or are borne to heaven in the chariot of the sun, the sun himself acting as groom holding the horses' heads (Plate XI), until it is no surprise to find them standing like gods, holding a figure of Victory, the old attribute of Zeus, like Honorius (Plate XII., Fig. 1), or seated, a visible deity under the arcuated pediment of a temple, the central figure to which all men's eyes must turn, the supplanter of the old cultus statues of the gods which once looked out upon the worshipper to command his homage as directly as the Christ in Glory over the portal of Chartres (Plate IV.), or the Beau Dieu de Reims in the days before the war. This centralising influence, this emphasis on a principal figure, was essential if the narrative art of the Greeks as we know it upon friezes and pediments without number was to gain new meaning, to be restored to unity of design, to appeal to the worshipper instead of to the artist or spectator; and in this way the imperial figure in art prepares the way for that of Christ. If such a design as

* "Apotheosis and After Life: Three Lectures on Certain Phases of Art and Religion in the Roman Empire." By Mrs. Arthur Strong, LL.D., Litt.D. (Constable & Co. 1915. 8s. 6d. net.)

Tomb of a Dead Boy, perhaps Prince of the Julio-Claudian House, Rome: Museo delle Terme.



The Emperor Valentinian: Silver Disc at Geneva.

is shown (Plate XIII., 2) were set before us without a legend most of us would see in it rather a figure of the risen Lord than a portrait of a Roman emperor of the West, and it is much to have so exquisite a work of art, a work which enlarges our conception of the antique, made for the first time really accessible. This image of Valentinian, "the vivid embodiment of the new centralised authority," set off by the attendant soldiers, whose only part is the service of their lord, suggests a vision of the risen Christ coming to the judgment with His saints behind him, gazing each towards his Lord, yet facing towards the world they come to judge; this is great art, one may say great religious art, and, like the Christian schemes of Raphael and Tintoretto, it depends for its significance upon that marshalling of figures in attendance upon a central figure which Mrs. Strong takes as the supreme contribution of Roman artists to the world.

The second and third lectures deal with the beliefs in an after life as we find them in art from the chariot of Monteleone and the sarcophagus of Haghia Triada down to the monuments of the second and third centuries A.D. The author shows that symbolism dominates these beliefs from the earliest times, that the chariot of the soul, the myths of Dionysiac joys, the need to guard the living from the haunting of the dead, all are but an expression of those beliefs whose influence was to dominate Ionian Greece and Classical Rome to a degree little realised by the ordinary student. Evil influences must be warded from the soul; therefore lions and cocks and other apotropaic objects must be placed upon their tombs. But equally the tomb is essential to the living; the dead must have a home, or his spirit would wander to the torment of the living, without its chance of translation to the higher sphere. Perhaps the noblest form of tomb the world has seen is the recumbent figure of the dead; this is found in Greek lands to an extent not often suspected, though the most familiar ancient examples—and, it may be added, not as a rule among the best—are the Etruscan. The exquisite recumbent figure on Plate XXII. (see page 35), representing some young Julian or Claudian prince, which we reproduce, gives us perhaps the finest Roman example of the kind. The boy lies as if asleep, with only the egg of immortality in the left hand and the crested snake at his side to mark that he has passed into the other world. As a poetical representation of sleep his figure, only found in 1909, has few superiors in art, and if it wants the stark and noble lines of the recumbent dead in mediæval art, it has a wonderful and appealing beauty. By some mistake Mrs. Strong has attributed to this, the eldest of the three great examples of the recumbent child, the poppies of immortality which belong to his youngest brother in the Capitoline Museum, in place of the crested snake which links this Roman monument with one of the oldest Hellenic objects with which she deals, the Chrysapha relief of the heroised ancestors. Underworld beliefs die hard, and their symbolism passes into other religions, sometimes with changed meanings—the form persists if the spirit changes. The book before us indeed furnishes us with another instance of the same process, the Greek myth of Heracles being received into heaven, which appears, charged with new meaning, on the monument of a family of merchants at Igel, near Trèves, whose symbolism Mrs. Strong is at pains to expound. In this new reading of the story the hero, type of the labouring human soul, is caught up in the chariot of Apotheosis, like Cæsar on the altar in the Capitol (Plate VII.), and borne into heaven to the presence of the goddess whom he served. So Greece and Rome meet and fulfil each other, and to deprecate the one because it does not stand where its predecessor stood is to ignore the progress of the human spirit and to be false to the spirit of Greece herself, ever seeking to know and to hear some new thing.

[*** The illustrations accompanying this review are taken from the book, and have been lent by the publishers, Messrs. Constable & Co.—ED.]

PORTLAND CEMENT.

AT a meeting of the Institution of Municipal Engineers recently Mr. Horace Boot, M.I.Mech.E., M.Inst.E.E., read a paper on "The Manufacture of Portland Cement," in the course of which he said:—

"Portland cement was probably first manufactured by Joseph Aspden in the eighteenth century; but that was a very different article to what Portland cement which will pass the standard specification is to-day. For it was not until some years later that there was any necessity for a proper uniform mixing of the ingredients, or a mixture that will not vary more than 1 per cent. in the whole year; nor was it considered necessary to grind to such fineness, or burn the slurry so thoroughly as is done to-day. Chemists have made a special study of this, and in all first-class cement the proportion of chalk or limestone to the silica, alumina, and ferric oxide must never vary more than 1 per cent. The constituents of cement, as is no doubt well known by all of you, consist of chalk or sometimes a hard limestone and clay or marl, depending a good deal upon the district from which the raw materials come.

The chief centres of the cement industry are the Thames, Medway, Cambridgeshire, Hull, and generally the North-East of England.

Portland cement was so called on account of its similarity to Portland stone when it is set, but it must not be confused with common lime, which is simply burnt limestone, and possesses no hydraulic properties; nor is it the same as hydraulic lime, which is made out of a slightly burnt mixture of limestone and clay, and has hydraulic properties. Great care has to be taken that the mixture of chalk or limestone with clay or shale is definitely and correctly proportioned. The product is ground very fine and burned at a very high temperature into the form of clinker, the temperature in rotary kilns being as much as 2,500 deg. Fahr. to 3,000 deg. Fahr. This clinker is then ground to powder, and it is usual to specify a fineness of 8 to 10 per cent. residue on a 180 by 180 sieve.

In cement making there are several important factors to be considered, such as the obtaining of the raw materials—that is, chalk or limestone, clay or shale. One, if not both, of the principal ingredients should be adjoining the site of the works, for cement is a cheap commodity and will not permit (if any profit is to be made on the mill) of expensive carriage on the raw materials. Hence the reason why the site of most cement mills is chosen where either or both of the necessary ingredients are present. Again, in the manufacture of cement large quantities of water and coal are required, as well as a suitable means of getting the manufactured product away, by shipment or rail.

It is thus evident that the site of a cement works should be very carefully chosen, that the soil should be carefully tested before finally determining the position. Again, the levels have to be considered to avoid having to haul the clay and chalk uphill, thus adding to the expense of manufacture. Facilities should be present for shipping or railing the cement, and it must be remembered that where large quantities have to be dealt with, such as 3,000 tons of cement per week, a single line of rails would become easily blocked, so that provision should be made for a double line connected to the main line of one of our railway company's systems, or a waterway, if shipment is desired.

If the site is anywhere near a town due regard should be given to the question of nuisance, for it is very difficult to keep the cement works clean, and sometimes the surrounding property might be depreciated for this reason on account of the cement dust.

There are in cement-making what may be called two processes:—

1. The dry process.
2. The wet process.

In the dry process, assuming the raw materials are limestone and clay, they would have to pass through the jaw-crusher machine, and the drying drums, the grinding plant, consisting of ball and tube mills, or combination tube mills, and then be conveyed to the mixing and storage silos, after which it would be burnt in the kilns. From the kilns it goes through the same grinding process as it does in the wet process.

In the wet process the treatment, assuming the raw materials are chalk and clay or marl, consists of passing the raw material through the rolls, from the rolls it drops into the wash mills, from the wash mills, where water is added, it is passed to the wet tube mills for finer grinding; from the wet tube mills it is stored in the slurry mixers and storage tanks. From these tanks it is pumped by the slurry pumps to the kilns. The clinker from the kilns is cooled by passing through a large cooler like a small kiln, and from there is taken by conveyers into the dry grinding mill, where it passes through ball and tube mills, and finally, after it has been ground to extreme fineness, sufficient to comply with the British Standard Specification, the cement is taken to the silos or storage bins, and when cool is ready for use.

When the raw materials are limestone and clay they pass through the jaw crushers, from there to the wet ball and tube mill, or combination wet mill, where water is added; from there to the slurry mixers and storage tanks, and the mixture is pumped by the slurry pumps to the kilns. The dry grinding plant is the same for each method."

The lecturer then dealt with the different types of grinding mills and kilns. As regards the latter, he said:—

"The cement industry has been entirely revolutionised by the use of the rotary kiln, for, after a description of same, it will at once be seen that the labour employed is reduced to a minimum, that a much more uniform and even burning of the cement is possible, with the result that, for ferro-concrete work, rotary-kiln cement is nearly always specified, and will command a higher price than the other kind burned in brick kilns.

The kiln is made up of boiler plates, and consists of a tube, varying in diameter; for an output of 1,000 tons per week it is usually about 9 ft. 6 in. diameter in the burning zone, and often weighs more than 300 tons. It is rotated on rollers, and is driven through gearing at a very slow speed. The fuel is blown in, in the form of powdered coal, and ignited on reaching the burning zone, which attains a temperature of 2,500 deg. Fahr. to 3,000 deg. Fahr. The hot gases travel through the kiln, which is placed at a slight angle above the horizontal, with the cool end at the highest, and on thus to the chimney.

In the cool or chimney end the slurry which is taken from the slurry mixers or storage tanks is pumped in and finally reaches the burning zone, and the clinker produced drops into the cooler, which is like a small kiln, and also revolving. Cold air is drawn in through this cooler to cool the clinker, which clinker takes the shape of round hard pebbles. An immense amount of time, labour, and thought has been spent on the designing of these kilns, for it is no easy engineering matter when one remembers the enormous weight to be revolved, the expansion and contraction that takes place on a length of 200 ft. or more. There are now several firms in this country who can build most excellent kilns, and there is no need to place orders for these kilns abroad. The hard burnt clinker, on leaving the cooler, is then taken to a clinker storage or to bins, and then to the dry grinding mill. With the rotary kiln it is possible to run a cement works, having an output of 2,000 to 3,000 tons per week, with a staff of only thirty men per shift; whereas for the same output with the 'Chamber brick kilns' this number of men would have been necessary for working the kilns only."

The lecturer dealt with the question of fuel and coal-grinding plant, and then went on to say:—

"After leaving the grinding mill the clinker which is now ground is conveyed and elevated into silos for storage. The silo buildings will have several bins with a total capacity of three to four weeks' output of finished cement, which will enable any purchaser, when carrying out an important contract, to have his own bin and draw from it as he desires, so that he can be assured of the uniform quality of the cement. For ferro-concrete work this is important, as you are all aware.

The why and wherefore of the greater use of reinforced concrete construction is not difficult to find. Those engineers who have had the designing of large structures to carry heavy machinery, such as is met with in industrial mills or for the building of large storage kilos or bins, will fully appreciate these remarks, because with a reinforced-concrete construction it is a simple matter to demonstrate in figures the strength of such buildings and allow a proper margin or factor of safety; whereas with brickwork such a calculation is very difficult and certainly unreliable, for nobody can accurately say what is the adhesion of brickwork and what factor of safety has been allowed.

Recently my firm has had to design some large silos, capable of holding 10,000 tons of cement, and it is surprising with brickwork how uncertain one is when finished as to the final strength. But if such silos are built with reinforced concrete one can be certain of the factor of safety.

There are several methods of building the silos, but the best one, I think, is to design it of ferro-concrete. The emptying of cement silos is not such a simple problem as it appears for cement arches when packed closely. An ingenious method to use is the vacuum process, in which a cement bag is put into a small chamber and the bag fixed on to a pipe connecting it with the silo. A vacuum is then produced in this chamber, causing the cement immediately to rush from the silo through the pipe into the bag and fill it. As soon as the bag (which is automatically weighed) is filled to the correct weight, the vacuum is cut off and the door of the chamber opens to allow the man to remove the sack. The cement in the bag is then ready for rail or shipment. A large loading platform with ample floor space is required, with railway lines running alongside it, so that the bags of cement can be loaded into trucks."

THE FUTURE OF OUR ENGINEERING INDUSTRIES.

IN the shadow of war and the stress of endeavouring to cope with the ever-growing demands—always more and more surprising in their ramifications—of the great colossus it is perhaps natural that reflections as to the industrial position of our nation at the termination of hostilities should not flow easily, for it is indeed a noisy and boisterous atmosphere in which to attempt mature deliberations. None the less it is true that if these reflections are delayed until peace comes into her own it will be too late to take advantage of many of the lessons which the war has taught, and of the changed situation which must be contemplated. When we hear of business men in Germany meeting nearly a year ago to discuss the problems and prepare for the modifications which this upheaval has produced we may well reflect upon the necessity for organisation, and feel that, whatever the outcome of the struggle, power of co-ordinating the interrelations of industry, which has meant so much to Germany, will be in no wise a dead thing in that country, and if broken will recover.

Had Britain possessed the appreciation for scientific arrangement and scientific principles enjoyed by our enemies, it is hardly too much to say that the war would have been over by now, and there is little doubt that the splendid individual characteristics possessed by our nation are very largely thrown away through the misdirection or lack of proper direction of its efforts. And it is probable that no one who has worked for any public service, whether in an official or private capacity, during the present crisis will feel inclined to dispute this view. The men are there, the means and the energy and capacity are there, but that great essential, the scheme which shall ensure that everyone is in his right place and working with and for his fellows on a preconceived and studied plan, is wanting. It may be said that the circumstances of this crisis are so exceptional that it was not to be expected that any pre-existing plans could meet the emergency.

Suppose, for example, that the whole of the engineering industries had before the war been co-ordinate for industrial purposes, by which is not meant linked up as a ring fence for the purposes of maintaining wage standards or profits, but so systematized that the parts common to all or to each group of such industries had been working together on a plan for general advancement. Had these great branches of our national prosperity possessed a "head" which was directing the hundred "arms" and the arms the "fingers" representing the specialised trades, how many mistakes, delays, overlappings, and financial wastages would have been prevented in summoning the united efforts of the hundred workers who are called upon in modern warfare to be the orderlies of a single private in the firing trench! Suppose that these industries, by what would have been a trivial individual contribution, had for their common benefit arranged, for example, in previous years to conduct a series of researches into the microstructure of metals, a subject (like many others which do not show a weekly return of profit) left almost entirely to the private efforts of a few professional individuals, what might have been the result at the present time? Had an alloy suitable for heavy ordnance even slightly superior to that in ordinary use been discovered, the effect upon the tide of war might well have been far-reaching enough not only to repay the outlay a thousandfold, but to earn for ever the gratitude of the nation.

What is wanted is an Intelligence Department, with a permanent committee sitting, not to hamper every trading firm with cast-iron regulations, but to act as a centre for the consideration of all matters affecting generally engineering interests. This department, which would be controlled by a committee representing the foremost experts in the trades, would be responsible for a great clearing house of information dealing with trade development, and a research factory devoted solely to experiments, not merely as conducted in the laboratory of the scientist, but with the addition of trials on a commercial scale. The Intelligence Department would develop the kind of work recently initiated by the Board of Trade for industries generally, and its duties would consist not only of digesting trade statistics and consular reports for the benefit of special branches of engineering, but of preparing pamphlets showing the progress of the applications of research in other countries. It would also act as a centre for the exchange of information on all relevant matters between the industries concerned.

The Research Department would conduct experiments in pure science with a view to advancing knowledge of the properties of the various materials used, and would probably concentrate its attention initially on ascertaining the relation of physical properties to chemical composition in the new fields of alloys of iron. In close touch with the scientists conducting these researches would be others less highly trained in laboratory research, but with a thorough appreciation of manufacturing conditions and requirements, who would conduct experiments in the research factory and lead to commercial value of the work in the laboratory.

The objection may be raised that each firm has its own methods and secrets, and if it makes discoveries prefers to benefit by them individually; but if this war has taught anything, it is surely that the power of efficient action united is the only thing which can bring safety and prosperity, and what is gained by the watertight compartment system is far more than lost by the lack of what may be called side-issue knowledge, for it is well established that the more any branch of industry advances the greater is the necessity for keeping in touch with other branches, which to the casual observer may appear to have but little connection with it.

If such a scheme as has been outlined possesses any merits, now is the occasion, not perhaps to introduce it into being, but to prepare for its introduction, and this for two reasons. Firstly, there has never been a time when the engineering industries have been brought into such close contact. Munition Committees control every machine tool in the country, statistics are available which have never previously existed, and there is a spirit of appreciation for science and organisation—albeit, born of necessity, not of education—which has never been known before in this country. Secondly, science has received an official recognition, for which it has been waiting since the days of the Prince Consort, in the formation of a Government Committee for Industrial Research. This is a strong Committee, composed of eminent statesmen, assisted by scientific and practical experts of recognised standing. Its labours are about to begin, and it is for industry to see that this great opportunity is not frittered down to the confines of mere academic work, as has been too often the result of lesser schemes. It is not suggested that it is the function of the Committee on Industrial Research to initiate such a scheme for the engineering interests, but were it put forward by the industries there is little doubt that most valuable co-operation might be obtained from this Committee, whose sympathies would be obviously inclined to any movement which would help to marshal the forces of mechanism.

The Emperor Valentinian: Silver Disc at Geneva.

is shown (Plate XIII., 2) were set before us without a legend most of us would see in it rather a figure of the risen Lord than a portrait of a Roman emperor of the West, and it is much to have so exquisite a work of art, a work which enlarges our conception of the antique, made for the first time really accessible. This image of Valentinian, "the vivid embodiment of the new centralised authority," set off by the attendant soldiers, whose only part is the service of their lord, suggests a vision of the risen Christ coming to the judgment with His saints behind him, gazing each towards his Lord, yet facing towards the world they come to judge; this is great art, one may say great religious art, and, like the Christian schemes of Raphael and Tintoretto, it depends for its significance upon that marshalling of figures in attendance upon a central figure which Mrs. Strong takes as the supreme contribution of Roman artists to the world.

The second and third lectures deal with the beliefs in an after life as we find them in art from the chariot of Monteleone and the sarcophagus of Haghia Triada down to the monuments of the second and third centuries A.D. The author shows that symbolism dominates these beliefs from the earliest times, that the chariot of the soul, the myths of Dionysiac joys, the need to guard the living from the haunting of the dead, all are but an expression of those beliefs whose influence was to dominate Ionian Greece and Classical Rome to a degree little realised by the ordinary student. Evil influences must be warded from the soul; therefore lions and cocks and other apotropaic objects must be placed upon their tombs. But equally the tomb is essential to the living; the dead must have a home, or his spirit would wander to the torment of the living, without its chance of translation to the higher sphere. Perhaps the noblest form of tomb the world has seen is the recumbent figure of the dead; this is found in Greek lands to an extent not often suspected, though the most familiar ancient examples—and, it may be added, not as a rule among the best—are the Etruscan. The exquisite recumbent figure on Plate XXII. (see page 35), representing some young Julian or Claudian prince, which we reproduce, gives us perhaps the finest Roman example of the kind. The boy lies as if asleep, with only the egg of immortality in the left hand and the crested snake at his side to mark that he has passed into the other world. As a poetical representation of sleep his figure, only found in 1909, has few superiors in art, and if it wants the stark and noble lines of the recumbent dead in mediæval art, it has a wonderful and appealing beauty. By some mistake Mrs. Strong has attributed to this, the eldest of the three great examples of the recumbent child, the poppies of immortality which belong to his youngest brother in the Capitoline Museum, in place of the crested snake which links this Roman monument with one of the oldest Hellenic objects with which she deals, the Chrysapha relief of the heroised ancestors. Underworld beliefs die hard, and their symbolism passes into other religions, sometimes with changed meanings—the form persists if the spirit changes. The book before us indeed furnishes us with another instance of the same process, the Greek myth of Heracles being received into heaven, which appears, charged with new meaning, on the monument of a family of merchants at Igel, near Trèves, whose symbolism Mrs. Strong is at pains to expound. In this new reading of the story the hero, type of the labouring human soul, is caught up in the chariot of Apotheosis, like Cæsar on the altar in the Capitol (Plate VII.), and borne into heaven to the presence of the goddess whom he served. So Greece and Rome meet and fulfil each other, and to deprecate the one because it does not stand where its predecessor stood is to ignore the progress of the human spirit and to be false to the spirit of Greece herself, ever seeking to know and to hear some new thing.

[*** The illustrations accompanying this review are taken from the book, and have been lent by the publishers, Messrs. Constable & Co.—ED.]

PORTLAND CEMENT.

AT a meeting of the Institution of Municipal Engineers recently Mr. Horace Boot, M.I.Mech.E., M.Inst.E.E., read a paper on "The Manufacture of Portland Cement," in the course of which he said:—

"Portland cement was probably first manufactured by Joseph Aspden in the eighteenth century; but that was a very different article to what Portland cement which will pass the standard specification is to-day. For it was not until some years later that there was any necessity for a proper uniform mixing of the ingredients, or a mixture that will not vary more than 1 per cent. in the whole year; nor was it considered necessary to grind to such fineness, or burn the slurry so thoroughly as is done to-day. Chemists have made a special study of this, and in all first-class cement the proportion of chalk or limestone to the silica, alumina, and ferric oxide must never vary more than 1 per cent. The constituents of cement, as is no doubt well known by all of you, consist of chalk or sometimes a hard limestone and clay or marl, depending a good deal upon the district from which the raw materials come.

The chief centres of the cement industry are the Thames, Medway, Cambridgeshire, Hull, and generally the North-East of England.

Portland cement was so called on account of its similarity to Portland stone when it is set, but it must not be confused with common lime, which is simply burnt limestone, and possesses no hydraulic properties; nor is it the same as hydraulic lime, which is made out of a slightly burnt mixture of limestone and clay, and has hydraulic properties. Great care has to be taken that the mixture of chalk or limestone with clay or shale is definitely and correctly proportioned. The product is ground very fine and burned at a very high temperature into the form of clinker, the temperature in rotary kilns being as much as 2,500 deg. Fahr. to 3,000 deg. Fahr. This clinker is then ground to powder, and it is usual to specify a fineness of 8 to 10 per cent. residue on a 180 by 180 sieve.

In cement making there are several important factors to be considered, such as the obtaining of the raw materials—that is, chalk or limestone, clay or shale. One, if not both, of the principal ingredients should be adjoining the site of the works, for cement is a cheap commodity and will not permit (if any profit is to be made on the mill) of expensive carriage on the raw materials. Hence the reason why the site of most cement mills is chosen where either or both of the necessary ingredients are present. Again, in the manufacture of cement large quantities of water and coal are required, as well as a suitable means of getting the manufactured product away, by shipment or rail.

It is thus evident that the site of a cement works should be very carefully chosen, that the soil should be carefully tested before finally determining the position. Again, the levels have to be considered to avoid having to haul the clay and chalk uphill, thus adding to the expense of manufacture. Facilities should be present for shipping or railing the cement, and it must be remembered that where large quantities have to be dealt with, such as 3,000 tons of cement per week, a single line of rails would become easily blocked, so that provision should be made for a double line connected to the main line of one of our railway company's systems, or a waterway, if shipment is desired.

If the site is anywhere near a town due regard should be given to the question of nuisance, for it is very difficult to keep the cement works clean, and sometimes the surrounding property might be depreciated for this reason on account of the cement dust.

There are in cement-making what may be called two processes:—

1. The dry process.
2. The wet process.

In the dry process, assuming the raw materials are limestone and clay, they would have to pass through the jaw-crusher machine, and the drying drums, the grinding plant, consisting of ball and tube mills, or combination tube mills, and then be conveyed to the mixing and storage silos, after which it would be burnt in the kilns. From the kilns it goes through the same grinding process as it does in the wet process.

In the wet process the treatment, assuming the raw materials are chalk and clay or marl, consists of passing the raw material through the rolls, from the rolls it drops into the wash mills, from the wash mills, where water is added, it is passed to the wet tube mills for finer grinding; from the wet tube mills it is stored in the slurry mixers and storage tanks. From these tanks it is pumped by the slurry pumps to the kilns. The clinker from the kilns is cooled by passing through a large cooler like a small kiln, and from there is taken by conveyers into the dry grinding mill, where it passes through ball and tube mills, and finally, after it has been ground to extreme fineness, sufficient to comply with the British Standard Specification, the cement is taken to the silos or storage bins, and when cool is ready for use.

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The lecturer then dealt with the different types of grinding mills and kilns. As regards the latter, he said :—

"The cement industry has been entirely revolutionised by the use of the rotary kiln, for, after a description of same, it will at once be seen that the labour employed is reduced to a minimum, that a much more uniform and even burning of the cement is possible, with the result that, for ferro-concrete work, rotary-kiln cement is nearly always specified, and will command a higher price than the other kind burned in brick kilns.

The kiln is made up of boiler plates, and consists of a tube, varying in diameter; for an output of 1,000 tons per week it is usually about 9 ft. 6 in. diameter in the burning zone, and often weighs more than 300 tons. It is rotated on rollers, and is driven through gearing at a very slow speed. The fuel is blown in, in the form of powdered coal, and ignited on reaching the burning zone, which attains a temperature of 2,500 deg. Fahr. to 3,000 deg. Fahr. The hot gases travel through the kiln, which is placed at a slight angle above the horizontal, with the cool end at the highest, and on thus to the chimney.

In the cool or chimney end the slurry which is taken from the slurry mixers or storage tanks is pumped in and finally reaches the burning zone, and the clinker produced drops into the cooler, which is like a small kiln, and also revolving. Cold air is drawn in through this cooler to cool the clinker, which clinker takes the shape of round hard pebbles. An immense amount of time, labour, and thought has been spent on the designing of these kilns, for it is no easy engineering matter when one remembers the enormous weight to be revolved, the expansion and contraction that takes place on a length of 200 ft. or more. There are now several firms in this country who can build most excellent kilns, and there is no need to place orders for these kilns abroad. The hard burnt clinker, on leaving the cooler, is then taken to a clinker storage or to bins, and then to the dry grinding mill. With the rotary kiln it is possible to run a cement works, having an output of 2,000 to 3,000 tons per week, with a staff of only thirty men per shift; whereas for the same output with the 'Chamber brick kilns' this number of men would have been necessary for working the kilns only."

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"After leaving the grinding mill the clinker which is now ground is conveyed and elevated into silos for storage. The silo buildings will have several bins with a total capacity of three to four weeks' output of finished cement, which will enable any purchaser, when carrying out an important contract, to have his own bin and draw from it as he desires, so that he can be assured of the uniform quality of the cement. For ferro-concrete work this is important, as you are all aware.

The why and wherefore of the greater use of reinforced concrete construction is not difficult to find. Those engineers who have had the designing of large structures to carry heavy machinery, such as is met with in industrial mills or for the building of large storage kilos or bins, will fully appreciate these remarks, because with a reinforced-concrete construction it is a simple matter to demonstrate in figures the strength of such buildings and allow a proper margin or factor of safety; whereas with brickwork such a calculation is very difficult and certainly unreliable, for nobody can accurately say what is the adhesion of brickwork and what factor of safety has been allowed.

Recently my firm has had to design some large silos, capable of holding 10,000 tons of cement, and it is surprising with brickwork how uncertain one is when finished as to the final strength. But if such silos are built with reinforced concrete one can be certain of the factor of safety.

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THE FUTURE OF OUR ENGINEERING INDUSTRIES.

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List of Competitions, Contracts, etc.

For some contracts still open, but not included in this List, see previous issues. **Those with an asterisk (*) are advertised in this number:** Competitions, —; Contracts, iv., vi.*; Public Appointments, lii; Auction Sales, lviii. Certain conditions beyond those given in the following information are imposed in some cases, such as: the advertisers do not bind themselves to accept the lowest or any tender; that a fair wages clause shall be observed; that no allowance will be made for tenders; and that deposits are returned on receipt of a bona-fide tender unless stated to the contrary.

The date given at the commencement of each paragraph is the latest date when the tender, or the names of those willing to submit tenders, may be sent in.

*** It must be understood that the following paragraphs are printed as news, and not as advertisements; and that while every endeavour is made to ensure accuracy, we cannot be responsible for errors that *may* occur.

Contracts.

BUILDING AND PAINTING.

The date given at the commencement of each paragraph is the latest date when the tender, or the names of those willing to submit tenders, may be sent in.

JANUARY 10. — **Newry.** — COTTAGE.—For the erection of a gatekeeper's cottage at Greenfields Crossing, between Newry and Goragh Wood, for the Directors of the Great Northern Railway Company. Drawings, etc., may be inspected at the Engineer's offices at Dublin and Belfast.

JANUARY 12.—**Rathdown.**—SLATING, ETC.—For keeping in order, for one, two, or three years, as may be decided, the slating, gutters, down-pipes, and chimneys, of all the Workhouse buildings, including out-offices, for the B.G. Specification by Mr. P. H. McCarthy, B.E. Forms of tender of Mr. Patrick Cunniam, Clerk of the Union, Clerk's Office, Loughlinstown.

JANUARY 13.—**Manchester.**—GLAZING.—For the glazing of a roof in the Smithfield Market for the Markets Committee. Specifications, etc., of Mr. R. Lawton, Works Manager, Coop-street Workshop, Smithfield Market, Manchester.

JANUARY 19.—**Romsey.**—DEMOLITION OF BUILDINGS AND ERECTION OF COTTAGES.—Pulling down of some existing buildings in Romsey and for the erection of three cottages on the site for the Corporation. Plans and specification of the Borough Surveyor, Market-place, Romsey.

JANUARY 24.—**Irlam.**—ARTISANS' DWELLINGS.—The U.D.C. invite tenders for the building of seventy-eight houses on three sites, as follows:—Thirty houses on site No. 1, twenty-eight on site No. 2, and eighteen on site No. 3. The conditions of contract, etc., may be inspected and copies of the bills of quantities, etc., obtained on application to Mr. Roland H. Winterbottom, Surveyor, Council Offices, Irlam, on payment of £5.

FEBRUARY 7.—**Lancashire and Yorkshire Railway.** — PAINTING. — The Directors invite tenders for painting at various places. Forms of tender, etc., may be obtained on personal application at the Engineer's Office, Hunt's Bank, Manchester.

FEBRUARY 9.— **Lancashire.** — PAINTING.— For painting at various places for the Directors of the Lancashire and Yorkshire Railway. Forms of tender, etc., on personal application at the Engineer's Office, Hunt's Bank, Manchester.

NO DATE.— **Kenmare.** — RECTORY.—For the erection of a rectory, for the Rev. R. P. Rowan, Kenmare. Mr. G. A. E. Hickson, architect, 23, Denny-street, Tralee. Deposit, £1 1s.

NO DATE. — **Rosyth.** — HOUSES.—Contractors prepared to tender for a minimum of twenty-five houses (all trades) are invited to send their names to the Scottish National Housing Company, Ltd., 111, George-street, Edinburgh.

FURNITURE, MATERIALS, etc.

JANUARY 8.—**Bourne.**—GRANITE, ETC.—Supply to the R.D.C. of about 6,000 tons of granite and 2,000 tons of slag. Tender forms of Mr. Thomas Lake, District Surveyor, Bourne.

JANUARY 12.—**Dublin.**—BUILDERS' MATERIALS.—Supply to the Dublin Port and Docks Board of builders' materials for twelve months, ending on January 31, 1917. Mr. N. Proud, Secretary, Port and Docks Office, Westmoreland-street, Dublin.

JANUARY 14.—**Irlam.**—BROKEN GRANITE, ETC.—Supply to the U.D.C. of the following materials required during the year ending March 31, 1917:—Broken granite, tarred slag, kerbs, setts and paviors' chippings, granite concrete flags, cement, stoneware pipes, iron castings. Forms of tender of Mr. R. H. Winterbottom, Surveyor, Council Offices, Irlam.

* JANUARY 20.—**Lambeth.**—MATERIALS AND SERVICES.—The Lambeth B.C. invite tenders for the supply of materials and for rendering certain services during 1916.

MARCH 8.—**Aberaman.**—PAINTS, ETC.—Supply to the directors of the Powell Duffryn Steam Coal Company, Ltd., from April 1, 1916, of paints, etc. Forms of tender, etc., of the Stores Manager, Aberaman Offices, near Aberdare.

ENGINEERING, IRON, AND STEEL.

JANUARY 10.—**Motherwell.**—FOOTBRIDGE.—Providing and erection of a footbridge over the railway at Motherwell, for the Directors of the Caledonian Railway Company. Drawings, specification, and schedule at the office of the Company's Engineer, Buchanan-street Station, Glasgow. Deposit, £2 2s.

* JANUARY 10.—**St. Pancras.**—EXTENSION OF POWER HOUSE.—The St. Pancras B.C. invite tenders for extension of power house.

JANUARY 11. — **Reigate.** — BOILER. — For the supply and installation of a new sectional boiler at the Baths, Castlefield-road, Reigate, for the T.C. Specification, etc., and full particulars may be obtained of Mr. Fred T. Clayton, Borough Surveyor, Municipal-buildings, Reigate.

JANUARY 13.—**Avonmouth.**—DRAIN DIVERSION, NORTH SIDE, ROYAL EDWARD DOCK.—Bristol Docks Committee invite tenders for the excavation of a deep trench and the laying of a 12-in. stoneware pipe drain at the Royal Edward Dock, Avonmouth, etc. Copies of the specification can be obtained from Mr. Thomas A. Peace, Engineer, Engineer's Office, Cumberland-road, Bristol, on production of a receipt for deposit of £1 paid to the Secretary of the Docks Committee, 19, Queen-square, Bristol.

NO DATE.—**Bath.**—BOILER.—For the supply and fixing of a new boiler for the heating apparatus at Kingsmead Council School, for the Education Authority. Specifications, etc., of the Surveyor of Corporate Property, Guildhall, Bath.

ROAD, SANITARY, AND WATER WORKS.

JANUARY 8. — **Castlebar.** — WATER-MAIN.—For supplying and laying about 550 lineal yds. of 2-in. cast-iron water-main. Specification prepared by Mr. E. K. Dixon, C.E.

JANUARY 12.—**Dublin.**—PAVING SETTS.—Supply to the Dublin Port and Docks Board, for the term of twelve months, ending January 1, 1917, of paving setts. Forms of proposal may be had between the hours of eleven and one o'clock, of Mr. N. Proud, secretary, Port and Docks Office, Westmoreland-street, Dublin.

JANUARY 13.—**Bristol.**—TRENCH AND PIPE DRAIN.—For the excavation of a deep trench and the laying of a 12-in. stoneware pipe drain at the Royal Edward Dock, Avonmouth, for the Docks Committee. Specification, etc., of Mr. Thomas A. Peace, Engineer, Engineer's Office, Cumberland-road, Bristol. Deposit of £1 to the Secretary of the Docks Committee, 19, Queen-square, Bristol.

JANUARY 22.—**Norwich.**—STONE, ETC.—Supply to the Eastern and Western Highways Committees of the Norfolk C.C. of flints, gravel, chalk, etc., for the year ending March 31, 1917. Specifications, etc., of Mr. W. W. Gladwell, County Surveyor, The Shirehouse, Norwich.

JANUARY 24.—**West Suffolk.**—SURFACE TARRING AND SUPPLY OF TAR.—(1) Surface tarring of various main roads in the county during 1916; (2) supply of refined tar or other proprietary article, for the surface treatment of roads. Conditions of contract, etc., may be obtained on application to Mr. W. Lionel Jenkins, A.M.Inst.C.E., County Surveyor's Office, Shire Hall, Bury St. Edmunds.

JANUARY 29. — **Worcester.** — GRANITE, ETC. — Supply to the Worcestershire C.C. of granite, blast furnace slag, and tar macadam during the year ending March 31, 1917. Forms of tender, etc., of Mr. C. F. Gettings, County Surveyor, 30, Foregate-street, Worcester.

TO CORRESPONDENTS.

NOTE.—All communications with respect to literary and artistic matters should be addressed to "THE EDITOR" (and not to any person by name); those relating to advertisements and other exclusively business matters should be addressed to THE BUILDER LTD., and *not* to the Editor.

All communications must be authenticated by the name and address of the sender, whether for publication or not. No notice can be taken of anonymous communications.

The responsibility of signed articles, letters, and papers read at meetings rests, of course, with the authors.

We cannot undertake to return rejected communications; and the Editor cannot be responsible for drawings, photographs, manuscripts, or other documents, or for models or samples sent to or left at this office, unless he has specially asked for them.

All drawings sent to or left at this office for consideration should bear the owner's name and address on either the face or back of the drawing. Delay and inconvenience may result from inattention to this.

Any commission to a contributor to write an article, or to execute or lend a drawing for publication, is given subject to the approval of the article or drawing, when received, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance.

N.B.—Illustrations of the First Premiated Design in any important architectural competition will always be accepted for publication by the Editor, whether they have been formally asked for or not.

CAMDEN TOWN AND WEST NORWOOD FIRE-STATIONS.

It has been agreed, on the recommendation of the Brigade Committee of the L.C.C., that tenders be invited from selected firms for the execution of the necessary painting work in connection with (1) the alterations in progress at the Camden Town fire-station, and (2) the erection of a new fire-station at West Norwood.

THE BUILDING TRADE, BRADFORD.

During the past year the building trade in Bradford has been seriously affected by the war. Just in one direction has the war been beneficial. It has led to the erection of a number of new workshops and to many extensions of premises where engineering work is carried on. Similarly there has been a considerable amount of work done in extending the premises of textile manufacturers to enable them to cope with the great rush of the past year for khaki and other cloths. While only one mill has been built, there have been twenty-eight workshops, fifteen warehouses, five weaving sheds, a combing shed, and two spinning sheds erected. It was in the backbone of the building trade—houses and shops—where the weakness manifested itself. A number of contracts of a public character would have been carried out this year had not the Local Government Board put their foot down and declared that the work must be postponed.

[Those with an asterisk (*) are advertised in this issue.]

PRICES CURRENT OF MATERIALS.

[Owing to the exceptional circumstances which prevail at the present time, prices of materials should be confirmed by inquiry.]

Since our last issue Portland cement, metals, slates, lead, glass, and oil prices have been increased.—ED.

*** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the highest or lowest. Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

Per 1000 Alongside, in River Thames.	£	s.	d.
Best Stocks	2	0	0
Picked Stocks for Facings	2	15	0

Per 1000, Delivered at Railway Depôt, London.

	£	s.	d.		£	s.	d.
Flettons	1	16	0	Best Blue Pressed Staffordshire	3	15	0
Best Fareham Red	3	12	0	Do. Bullnose	4	0	0
Best Red Pressed Ruabon Facing	5	0	0	Best Stourbridge Fire Bricks	4	0	0

GLAZED BRICKS—

Best White, Ivory, and Salt Glazed Stretchers	13	0	0	D'ble Str'tch'rs	18	10	0
				Double Headers	15	10	0
				One Side and two Ends	19	10	0
Headers	12	10	0	Two Sides and one End	20	10	0
Quoins, Bullnose and 4½ in. Flats	16	10	0	Splays and Squints	18	0	0

Second Quality £1 per 1000 less than best.

	s.	d.
Thames and Pit Sand	8	0 per yard, delivered.
Thames Ballast	6	9 " " "

Per ton, delivered.

	£	s.	d.		£	s.	d.
Best Portland Cement	2	5	0	..	2	8	0

Do. £2 1s. alongside in 80-ton lots.
Ferrocrete 2s. 6d. per ton extra on above.

Best Ground Blue Lias Lime	1	1	0	..		—	

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime ..... 17s. 0d. per yard delivered.
Stourbridge Fireclay in s'cks 35s. 0d. per ton at rly. dpt.

STONE.

	s.	d.
BATH STONE—delivered in railway trucks at Westbourne Park, Paddington, G.W.R., or South Lambeth, G.W.R., per ft. cube	1	7
Do. do. delivered in Railway trucks at Nine Elms, L. & S.W.R., per ft. cube	1	8½
Do. do. delivered on road waggons, Nine Elms Depôt	1	9½

PORTLAND STONE—

Brown Whitbed, in random blocks of 20 ft. average, delivered in railway trucks at Westbourne Park, G.W.R., South Lambeth, G.W.R., or Nine Elms, L. & S.W.R., per ft. cube	2	5½
Do. do. delivered on road waggons at Pimlico Wharf or Nine Elms Depôt, per ft. cube	2	6½

White Basebed, 2d. per ft. cube extra.

Per Ft. Cube, delivered at Railway Depôt.

	s.	d.		s.	d.
Ancaster in blocks	1	11	Red Corsehill in blocks	2	6
Beer in blocks	1	7	Closeburn Red Freestone	2	2
Greenshill in blocks	2	0	Red Mansfield Freestone	2	6
Darley Dale in blocks	2	6			

YORK STONE—*Robin Hood Quality.*

Per Ft. Cube, Delivered at Railway Depôt.	s.	d.
Scappled random blocks	2	10

Per Ft. Super., Delivered at Railway Depôt

6 in. sawn two sides landings to sizes (under 40 ft. super.)	2	8
6 in. rubbed two sides ditto, ditto	3	2
3 in. sawn two sides slabs (random sizes)	1	0
2 in. to 2½ in. sawn one side slabs (random sizes)	0	8
1½ in. to 2 in. ditto, ditto	0	6½

HARD YORK—

Per Ft. Cube, Delivered at Railway Depôt.

Scappled random blocks	3	0

Per Ft. Super., Delivered at Railway Depôt.

6 in. sawn two sides landing to sizes (under 40 ft. super.)	2	9
6 in. rubbed two sides ditto	3	3
3 in. sawn two sides slabs (random sizes)	1	2½
2 in. self-faced random flags	0	6

TILES.

	Per 1000 f.o.r. London. £	s.	d.
Best machine-made tiles or hand-made sand-faced tiles from either Broseley or Staffordshire district	2	12	6
Ornamental ditto	2	15	0
Hip and valley tiles (per dozen)	0	5	6

SLATES.

	Per 1000 of 1200 f.o.r. London. £	s.	d.
Best Blue Bangor slates, 20 by 10	11	16	0
First quality " "	11	10	0
" " 16 by 8	5	15	0
Best Blue Portmadoc, 20 by 10	11	13	6
First quality " "	11	3	6
" " 16 by 8	5	15	0

WOOD.

BEST BUILDING REDWOOD.

Imported sizes.	Per standard. £	s.	d.		£	s.	d.
Deals: 4 in. by 12 in., 4 in. by 11 in., 3 in. by 11 in., 4 in. by 9 in., and 2 in. by 11 in.	22	0	0	..	23	0	0
3 in. by 9 in., 2½ in. by 9 in. and 2 in. by 9 in.	21	10	0	..	22	10	0

WOOD (*Continued*).

BEST BUILDING REDWOOD.

	Per standard. £	s.	d.		£	s.	d.
Battens: 2 in., 2½ in., and 3 in. by 8 in.	20	0	0	..	20	10	0
2 in., 2½ in., and 3 in. by 7 in.	20	0	0	..	20	10	0
2 in., 2½ in., and 3 in. by 6 in.	19	10	0	..	20	0	0
2 in., 2½ in., and 3 in. by 5 in.	18	10	0	..	19	0	0
Scantlings: 2 in. by 3 in., 2 in. by 3½ in., 2 in. by 4 in., 2 in. by 4½ in.	19	0	0	..	19	10	0
3 in. by 4 in., and 3 in. by 4½ in.	20	0	0	..	20	10	0
Boards: 1 in., 1¼ in., and 1½ in. by 6 in. and 7 in.	0	10	0	} more than			
¾ in.	1	0	0	} battens.			
Seconds: building quality deals, battens, boards, and scantlings	1	0	0	less than best.			
Best Middling Dantzic and Memel Fir Timber Logs (average specification)	Per load of 50 ft. cube. 7	10	0	..		—	
Seconds do. do.	7	0	0	..		—	
9 in. to 10 in. do.	6	10	0	..		—	
6 in. to 8 in. do.	6	0	0	..		—	
Stocks very limited.							
Sawn pitch pine logs (about 35 cu. ft. average)	Per load. 8	0	0	..	8	10	0
Do. 6 in. to 10 in.	6	5	0	..	6	10	0
Sawn Swedish Balks 4 in. by 4 in. to 6 in. by 7 in.	6	0	0	..	6	10	0
	Per standard.						
Best Pitch Pine Deals	34	0	0	..	35	0	0
Rio do.	23	0	0	..	25	0	0
Under 2 in. thick	0	10	0		extra.		

JOINERS' WOOD.

White Sea First Quality Red: 4 in. by 11 in.	35	0	0	..	36	0	0
3 in. by 11 in., and 2 in. by 11 in.	34	0	0	..	35	0	0
4 in. by 9 in.	33	0	0	..	34	0	0
3 in. by 9 in., and 2½ in. by 9 in.	32	0	0	..	33	0	0
9 in. by 11 in. boards	1	0	0	more than deals.			
7 in. and 8 in. battens	24	0	0	..	25	0	0
7 in. and 8 in. boards	1	0	0	more than battens.			
Seconds quality	2	0	0	less than best.			
Third quality	£2 to £3			less than seconds.			
Archangel White Deals—							
Best 3 in. by 11 in.	28	0	0	..	29	0	0
3 in. by 9 in. and 10 in.	26	0	0	..	27	0	0
Seconds, do.	1	10	0	less than best.			
U.S. Battens	19	10	0	..	20	0	0
Prepared Floorings and Matchings, Seconds Swedish Red and equal—	Per square actual.						
1¼ in. by 7 in. planed and shot	1	4	0	..	1	5	0
1¼ in. by 7 in. planed and matched	1	4	6	..	1	5	0
1 in. by 7 in. planed and shot	0	19	0	..	1	0	0
1 in. by 7 in. planed and matched	0	19	6	..	1	0	6
¾ in. by 7 in. planed, matched and beaded, or V jointed	0	15	0	..	0	16	0
1 in. by 7 in. do.	0	19	6	..	1	0	6
¾ in. by 7 in. do.	0	12	6	..	0	13	0
6 in. at 6d. per square less than 7 in.							
5 in. and 5½ in. at 6d. per square less than 6 in.							
White Floorings at 6d. to 1s. per square less than Redwood.							
Columbian or Oregon Pine, best quality	Per standard. 28	0	0	..	29	0	0
Yellow Pine—First, regular sizes	57	0	0		upwards.		
Oddments	39	0	0		"		
Seconds, regular sizes	43	10	0		"		
Oddments	37	10	0		"		
Kauri Pine—Planks per ft. cube	0	7	6	..		—	
Oak Logs—							
Large, per ft. cube	0	6	0	..	0	6	6
Small " "	0	5	0	..	0	5	6
Wainscot Oak Logs, per ft. cube	0	10	6	..	0	12	6
Dry Wainscot Oak, per ft. super, as inch	0	1	0	..	0	1	3
¾ in. do. do.	0	0	10	..	0	1	0
Dry Mahogany—Honduras, Tabasco, per ft. super, as inch	0	1	0	..	0	1	4
Selected, Figury, per ft. super, as inch	0	1	6	..	0	2	6
Cuba Mahogany	0	1	6	..	0	2	6
Dry Walnut, American, per super, as inch	0	1	0		upwards.		
French, "Italian," Walnut	0	1	0	..	0	1	6
Teak, per load (Rangoon or Moulmein)	28	0	0	..	34	0	0
Do. do. (Java)	25	0	0	..	27	0	0
American Whitewood planks, per ft. cube	0	6	6	..	0	7	6

METALS.

JOISTS, GIRDERS, &c.

	In London or delivered Railway Vans, per ton. £	s.	d.		£	s.	d.
Rolled Steel Joists, ordinary sections, basis price	16	15	0	..	17	15	0
Plain Compound Girders, ordinary Sections	18	10	0	..	19	10	0
Plain Compound Stanchions	19	10	0	..	21	0	0
Angles, Tees, and Channels, ordinary sections	17	0	0	..	18	10	0
Flitch Plates	17	0	0	..	17	10	0
Cast Iron Columns and Stanchions, plain ordinary patterns	13	10	0	..	14	0	0

(Turning extra.)

METALS (*Continued*).

IRON—	Per ton, in London. £	s.	d.		£	s.	d.
Common Bars	16	0	0	..		—	
Staffordshire Crown Bars, good merchant quality	16	10	0	..	17	0	0
Staffordshire "Marked Bars"	17	0	0	..	17	10	0
Mild Steel Bars	16	10	0	..	17	0	0
Steel Bars, Ferro-Concrete quality, £17 10s. basis price.							
Hoop Iron, basis price	17	10	0	..		—	
" " Galvanised	28	0	0	..	30	0	0
(*And upwards, according to size and gauge.)							
Sheet Iron Black—							
Ordinary sizes to 20 g.	16	10	0	..		—	
" " 24 g.	17	10	0	..		—	
" " 26 g.	18	0	0	..		—	
Sheet Iron, Galvanised flat, ordinary quality—							
Ordinary sizes, 6 ft. by 2 ft. to 3 ft. to 20 g.	25	0	0	..		—	
Ordinary sizes to 22 g. and 24 g.	26	0	0	..		—	
Ordinary sizes to 26 g.	27	0	0	..		—	
Sheet Iron, Galvanised, flat, best quality—							
Ordinary sizes to 20 g.	27	0	0	..		—	
" " 22 g. and 24 g.	27	10	0	..		—	
Ordinary sizes to 26 g.	28	0	0	..		—	
Galvanised Corrugated Sheets—							
Ordinary sizes, 6 ft. to 8 ft. 20 g.	25	0	0	..		—	
Ordinary sizes, 22 g. & 24 g.	25	10	0	..		—	
Ordinary sizes, 26 g.	26	0	0	..		—	
Best Soft Steel Sheets, 6 ft. by 2 ft. to 3 ft. to 20 g. and thicker	19	15	0	..		—	
Best Soft Steel Sheets, 22 g. & 24 g.	20	5	0	..		—	
Best Soft Steel Sheets, 26 g.	21	15	0	..		—	
Cut Nails, 3 in. to 6 in.	18	0	0	..		—	
(Under 3 in., usual trade extras.)							

LEAD, &c.

LEAD—Sheet, English, 4 lb. and up	Delivered in London. £	s.	d.		£	s.	d.
	36	10	0	..		—	
Pipe in coils	37	0	0	..		—	
Soil pipe	40	0	0	..		—	
Compo pipe	40	0	0	..		—	

NOTE—Country delivery 20s. per ton extra; lots under 5 cwt. 1s. per cwt. extra.

COPPER—							
Strong Sheet per lb.	0	1	5	..		—	
Thin " "	0	1	6	..		—	
Copper nails "	0	1	5	..		—	
Copper wire "	0	1	5	..		—	
BRASS—							
Strong Sheet "	0	1	3	..		—	
Thin "	0	1	4	..		—	
TIN—English Ingots "	0	1	10	..		—	
SOLDER—Plumbers' "	0	0	10	..		—	
Tinmen's "	0	1	0	..		—	
Blowpipe "	0	1	2	..		—	

GLASS.

ENGLISH SHEET GLASS IN CRATES OF STOCK SIZES AND IN SQUARES IN ORDINARY SIZES.

	Per Ft.		Per Ft.
15 oz. thirds	5½d.	32 oz. thirds	8½d.
21 oz. thirds	6½d.	" fourths	7½d.
" fourths	5½d.	Fluted Sheet, 15 oz.	5½d.
26 oz. thirds	7d.	" 21 oz.	6½d.
" fourths	6½d.		

ENGLISH ROLLED PLATE IN CRATES OF STOCK SIZES.

	Per Ft.
⅛ Rolled plate	4d.
⅜ Rough rolled and rough cast plate	4½d.
½ Rough rolled and rough cast plate	4½d.
Figured Rolled, Oxford Rolled, Oceanic, Arctic, Muffled, and Rolled Cathedral, white	5d.
Ditto, tinted	6½d.
Rolled Sheet	4d.

OILS, &c.

		£	s.	d.
Raw Linseed Oil in pipes per gallon		0	3	9
" " " in barrels	"	0	3	10
" " " in drums	"	0	4	1
Boiled " " in barrels	"	0	4	0
" " " in drums	"	0	4	4
Turpentine in barrels	"	0	4	6
" in drums	"	0	4	9
Genuine Ground English White Lead, per ton (In not less than 5 cwt. casks.)		43	15	0
Red Lead, Dry per ton		42	10	0
Best Linseed Oil Putty per cwt.		0	10	0
Stockholm Tar per barrel		1	12	0

GENUINE WHITE LEAD PAINT—

"Blackfriars," "Nine Elms," "Park," and other best brands (in 14 lb. tins) not less than 5 cwt. lots per ton delivered	54	10	0

VARNISHES, &c.

	Per gallon. £	s.	d.
Fine Pale Oak Varnish	0	8	0
Pale Copal Oak	0	10	6
Superfine Pale Elastic Oak	0	12	6
Fine Extra Hard Church Oak	0	10	0
Superfine Hard-drying Oak, for seats of Churches	0	14	6
Fine Elastic Carriage	0	12	9
Superfine Pale Elastic Carriage	0	16	0
Fine Pale Maple	0	10	0
Finest Pale Durable Copal	0	18	6
Extra Pale French Oil	1	1	0
Eggshell Flating Varnish	0	18	0
White Pale Enamel	1	4	0
Extra Pale Paper	0	12	0
Best Japan Gold Size	0	10	0
Best Black Japan	0	16	0
Oak and Mahogany Stain	0	9	0
Brunswick Black	0	8	0
Berlin Black	0	16	0
Knotting	0	10	0
French and Brush Polish	0	10	0

PATENTS.

APPLICATIONS PUBLISHED.*

19,227 of 1914.—James Thomas Battersby: Coupling for ropes, cords, or the like.

21,672 of 1914.—Moses Kellow: Roof-coverings.

23,000 of 1914.—Henry James Craymer: Hammering apparatus.

23,493 of 1914.—Ernest Joseph Taylor: Supports for raidators for heating buildings and the like.

23,569 of 1914.—Vulcan Foundry, Ltd., and William Collingwood: Tube joints.

23,726 of 1914.—Niels Bendixen and Montague Brown Mountain: Electric fire-alarm apparatus.

3,813 of 1915.—Hugh Donald Fitzpatrick (Marguerite Rutten, Belgium): Water waste preventing apparatus.

4,368 of 1915.—Robert Falkland Carey and Waygood-Otis, Ltd.: Joints or connections for hosepipes and the like.

5,880 of 1915.—Frederick William Blair: Steps or ladders.

7,383 of 1915.—Robert Alexander Rutland: Portable shower baths.

7,415 of 1915.—George Molyneux Park: Apparatus for cooling clinker in the manufacture of cement and for like cooling purposes.

7,430 of 1915.—Thomas Sanders: Casement and like stays and fasteners.

7,803 of 1915.—Joseph Aloysius Frauenheim: Manufacture of bolts.

7,959 of 1915.—James Walter Beckett: Construction of portable huts.

8,442 of 1915.—George Rutter, jun.: Roller blinds, screens, and the like.

8,458 of 1915.—Frederick William Uren and Aubrey Gamble: Means for joining up the ends of electrical conduits.

8,671 of 1915.—George R. Wimberly: Doors.

9,191 of 1915.—William Bachelier Caswell: Window-blind roller brackets.

9,786 of 1915.—Henry James Hubert King: Combined pipe junctions and cocks.

9,806 of 1915.—John Alexander Steven: Electric switches for controlling lift or other motors.

9,818 of 1915.—James Ellis Barraclough: Saddle or protection plates of domestic or like ovens.

9,886 of 1915.—Charles Rees Williams: Reinforced cement pedestal casing for water-closet pans.

*All these applications are in the stage in which opposition to the grant of Patents upon them can be made.

Austrian
RUSSIAN and JAPANESE
PRIME DRY
WAINSCOT **Oak**
SYDNEY PRIDAY,
KING WILLIAM HOUSE, 2a, EASTCHEAP, LONDON, E.C.
Depot: Wainscot Sheds, Millwall, E. T.N.: *Avenue 667.*

NEW COMPANIES.

THE undermentioned particulars of new companies recently registered are taken from the Daily Register compiled by Messrs. Jordan & Sons, Ltd., Company Registration Agents, Chancery-lane, W.C.

DAVIES BROTHERS (WALTHAMSTOW), LTD. (142,460), Blackhorse-lane, Walthamstow. Registered December 20. To carry on business of steam joiners, timber merchants, builders, estate developers, and sawmills, now carried on by Davies Brothers at above address. Nominal capital, £15,000 in 15,000 £1 shares.

JOHN LEVICK, LTD. (142,597), 149, Alma-street, Aston, Birmingham. Registered December 22. To acquire and take over business of metallic and railway fittings, electrical, mechanical, and general engineers, brass and iron founders, and metals of all kinds, now carried on by J. Levick at above address, builders, contractors, etc. Nominal capital, £50,000 in 50,000 £1 shares.

A. & B. HANSON, LTD. (142,512). Registered December 23. To carry on business of builders, contractors, decorators, surveyors, land and house and estate agents, sanitary, gas and electrical engineers, coach builders, saddlers, etc. Nominal capital, £5,000 in 5,000 £1 shares.

H. COLEMAN & CO., LTD. (142,517). Registered December 23. To acquire, take over, and carry on business of furnishing and general ironmongers, builders, merchants, water and sanitary engineers, now carried on by W. Coleman at High-street, Harlow, and to carry on business of iron, brass, and other metal workers, dealers in earthenware, etc. Nominal capital, £1,200 in 1,200 £1 shares.

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TENDERS.

Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than 2 p.m. on Wednesday.* [N.B.—We cannot publish Tenders unless the amount of the Tender is stated.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

ILFORD.—For the supply of triple concentric electric light cable, for the Urban District Council:—

W. T. Henley's Telegraph Works Co., Ltd., Blomfield-street, E.C.* £2,260 4 6

NORTHAMPTON.—For alterations to and equipment of a room at the Borough Accountant's office, for the Corporation:—

Beardsmore & West‡ £94 16

‡ Recommended for acceptance.

SOUTHAMPTON.—For proposed additional dining-room accommodation, 98, Above Bar-street, Southampton. Mr. William Burrough Hill, architect, Southampton:—

W. Nash	£1,344
H. Cawte	1,178
H. Stevens & Co.	1,163
Jenkins & Sons, Southampton†	1,126

AUSTRIAN and RIGA.
FIRST-CLASS, MILD GRAINED, DRY
WAINSCOT **OAK.**
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Carpenters' Road, Stratford, E.
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Ham Hill Stone.
Doulting Stone.
Portland Stone.
The Ham Hill and Doulting Stone Co., Limited
(incorporating the Ham Hill Stone Co. and C. Trask & Son, The Doulting Stone Co.).
Norton, Stoke-under-Ham, Somerset.
London Agent:—Mr. E. A. Williams, 16, Craven-street, Strand.

Asphalte.—The Seyssel and Metallic Lava Asphalte Co. (Mr. H. Glenn), Office, 42, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds and milk-rooms, granaries, tun-rooms, and terraces. Asphalte Contractors to Forth Bridge Co. T.N. 2644 Central.

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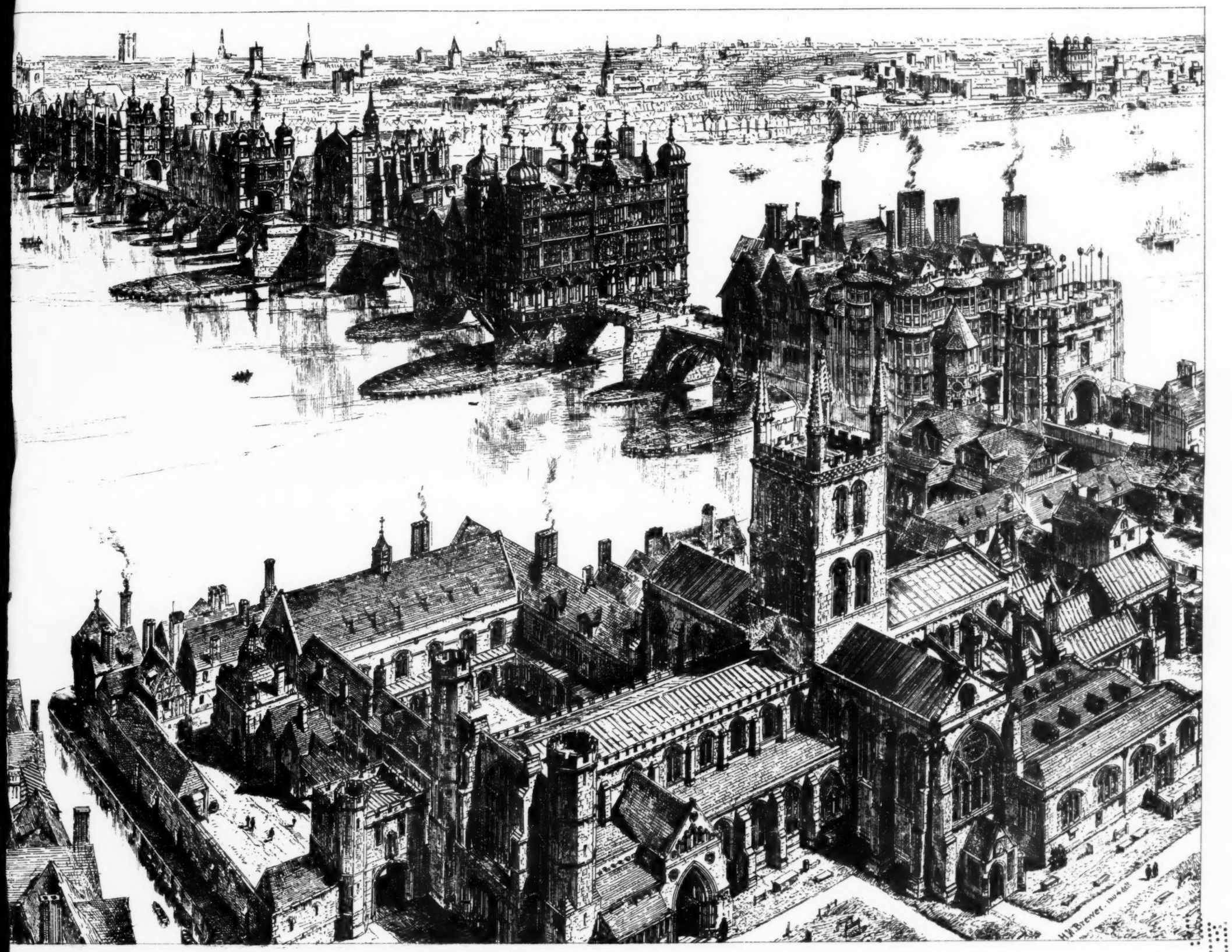
BANK HOLIDAYS.

April 21	Good Friday.
April 24	Easter Monday.
June 12	Whit Monday.
August 7	Monday.
Dec. 25	Christmas (Mon.)
Dec. 26	Tuesday.

OLD LONDON BRIDGE (FRO

Old London Bridge was preceded by previous structures of which we know little, but a wooden bridge probably existed designer being a Parish Priest known as Peter of Colechurch, and it was finally completed in 1206. In 1577 the In 1582 a Dutchman built the Waterworks (shown as a building with a tower, close to the northern end of the Bridge) to accommodate the growing traffic, and in 1829 the New Bridge was begun and was fini

BUILDER" CALENDAR 1916.



OLD LONDON BRIDGE (FROM THE SURREY SIDE).

was preceded by previous structures of which we know little, but a wooden bridge probably existed as early as the 3rd century. The first stone of the famous Bridge was laid in 1176, its rish Priest known as Peter of Colechurch, and it was finally completed in 1206. In 1577 the Bridge House between the Southwark (Traitor's) Gate and Nonesuch House was begun. built the Waterworks (shown as a building with a tower, close to the northern end of the Bridge). Between 1756-1760 George Dance and Sir R. Taylor constructed a big middle arch to accommodate the growing traffic, and in 1829 the New Bridge was begun and was finished in 1831, the Old Bridge being finally removed in 1832.

CHRONOLOGICAL NOTES.

Ash Wednesday	March 8.
Good Friday -	April 21.
Easter Day - -	April 23.
Ascension Day -	June 1.
Whit Sunday -	June 11.
Christmas (Mon).	Dec 25.

July

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November

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December

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WREN'S FIRST DESIGN FOR ST. PAUL'S: INTERIOR VIEW, B

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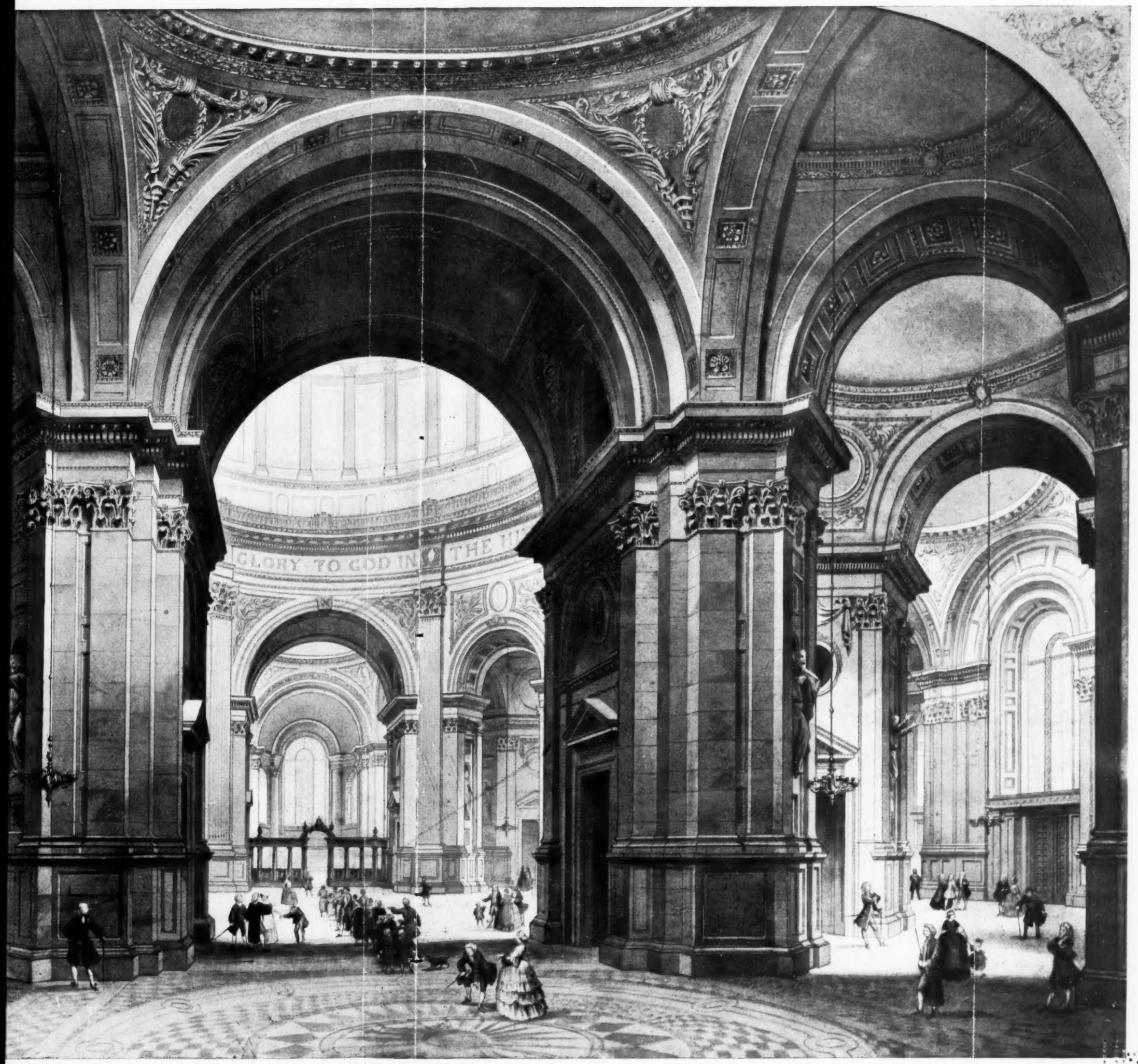

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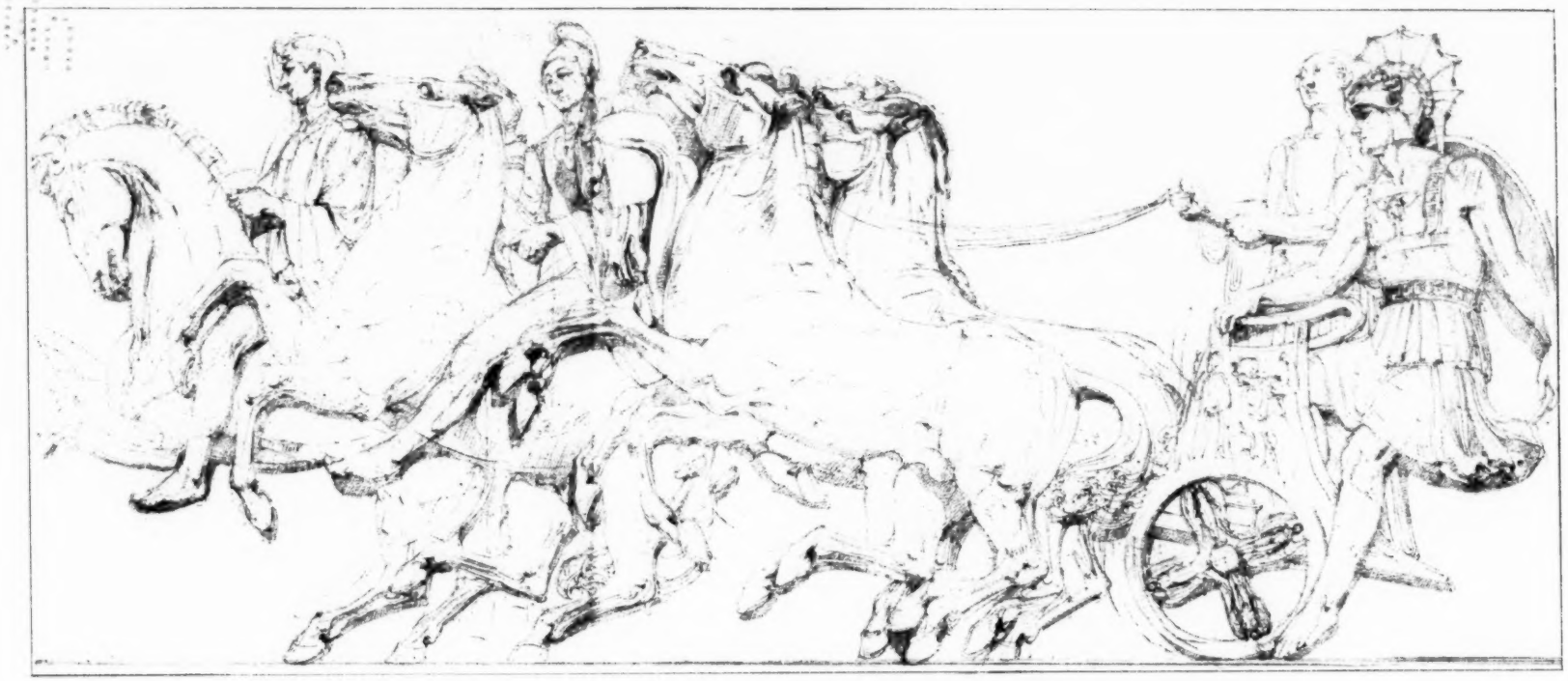
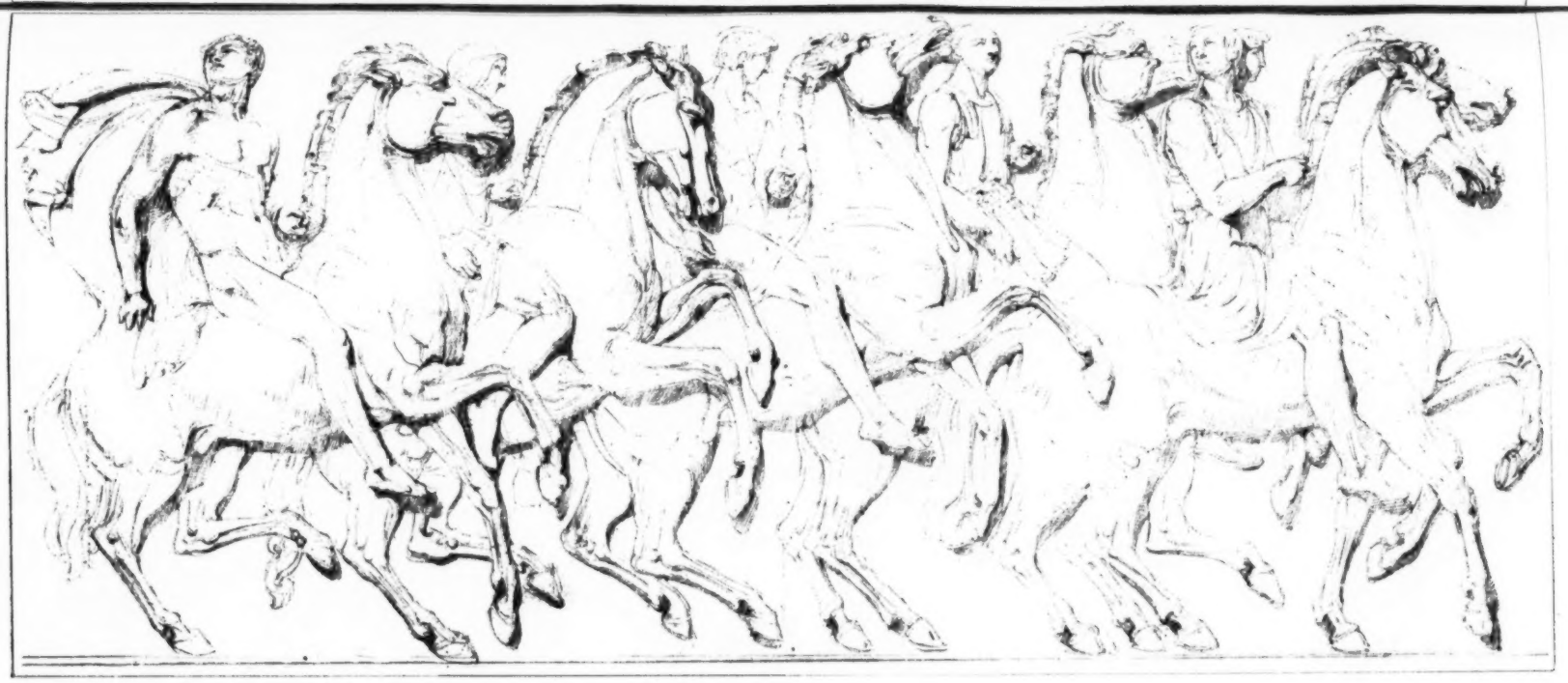
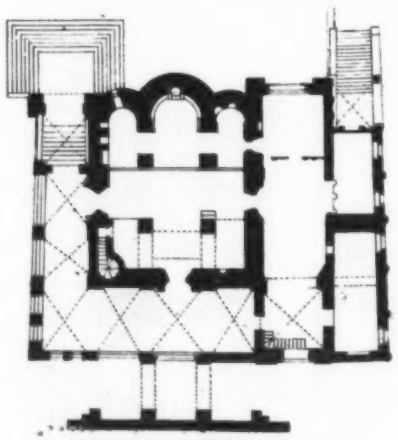




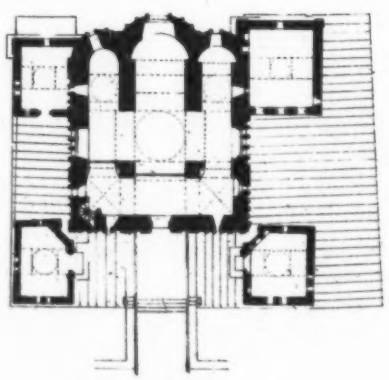
PORTION OF FRIEZE OF THE PARTHENON.—CONJECTURAL RESTORATION, BY MR. ALFRED C. CONRADE.

SECTION, FROM EAST TO WEST.

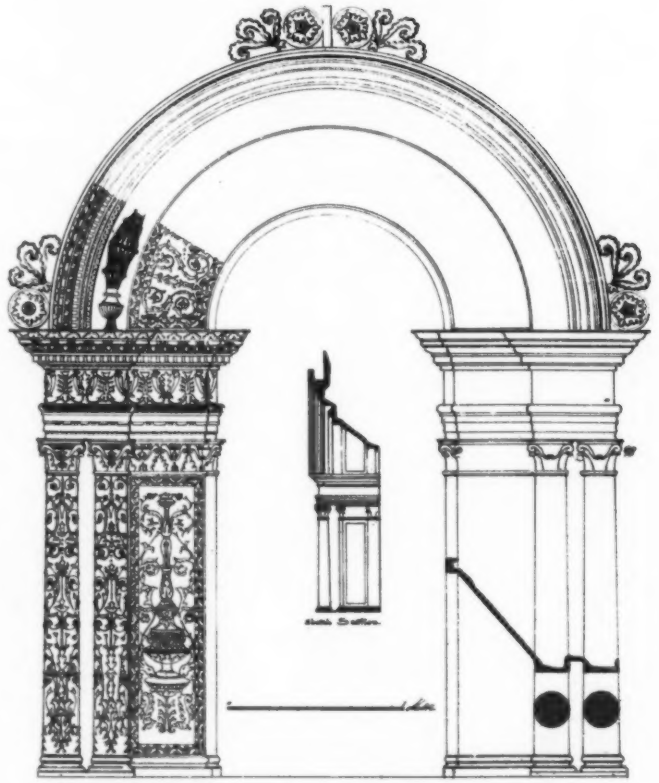
SKETCH OF CHURCH.



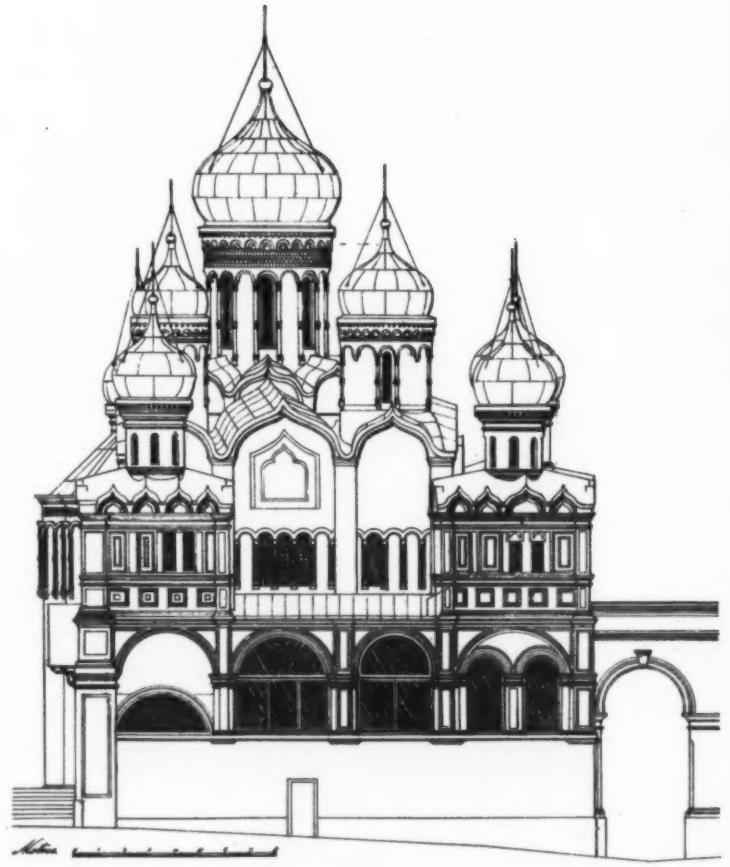
GROUND PLAN.



FIRST FLOOR PLAN.

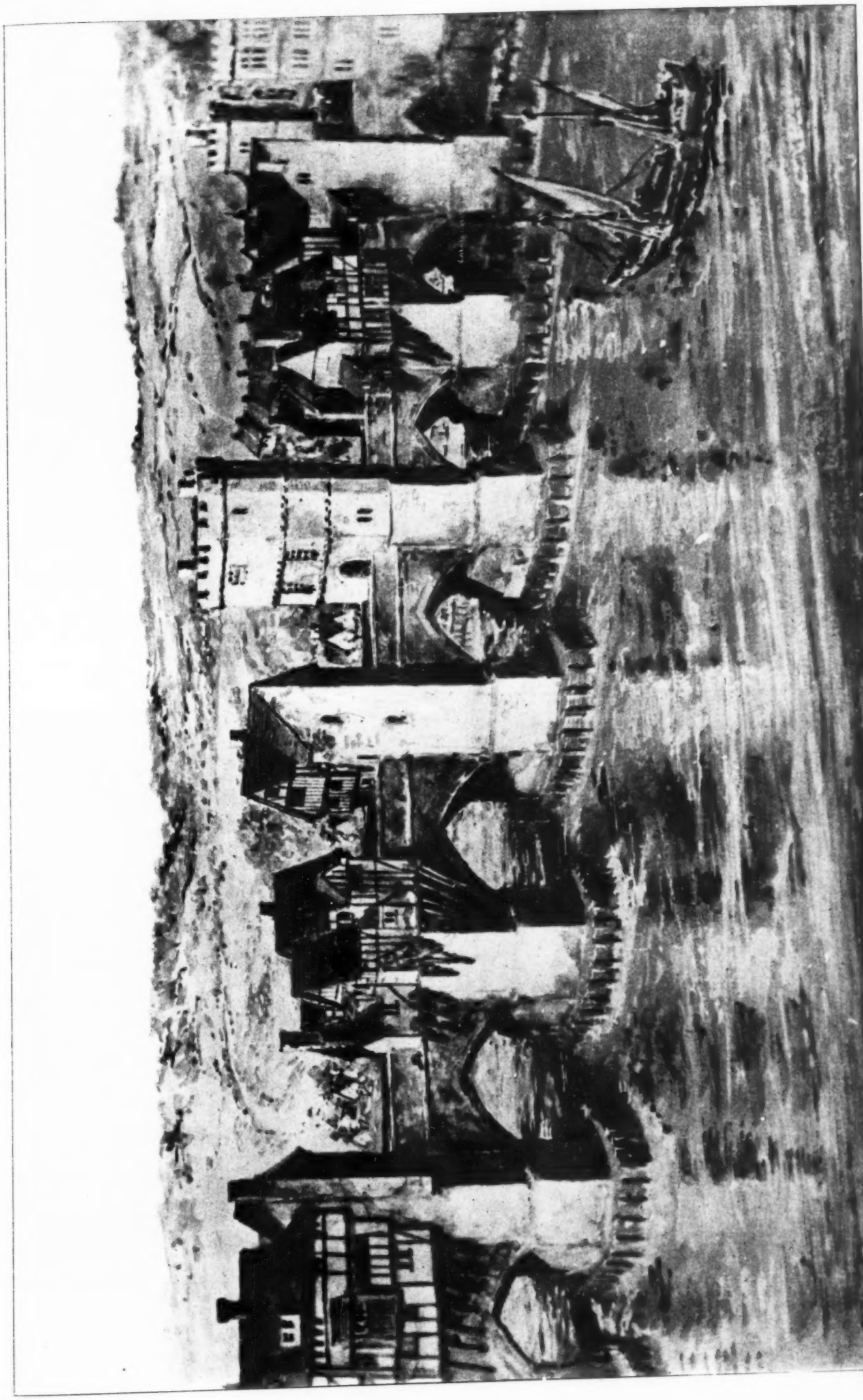


DETAILS OF WEST DOOR TO NAVE.

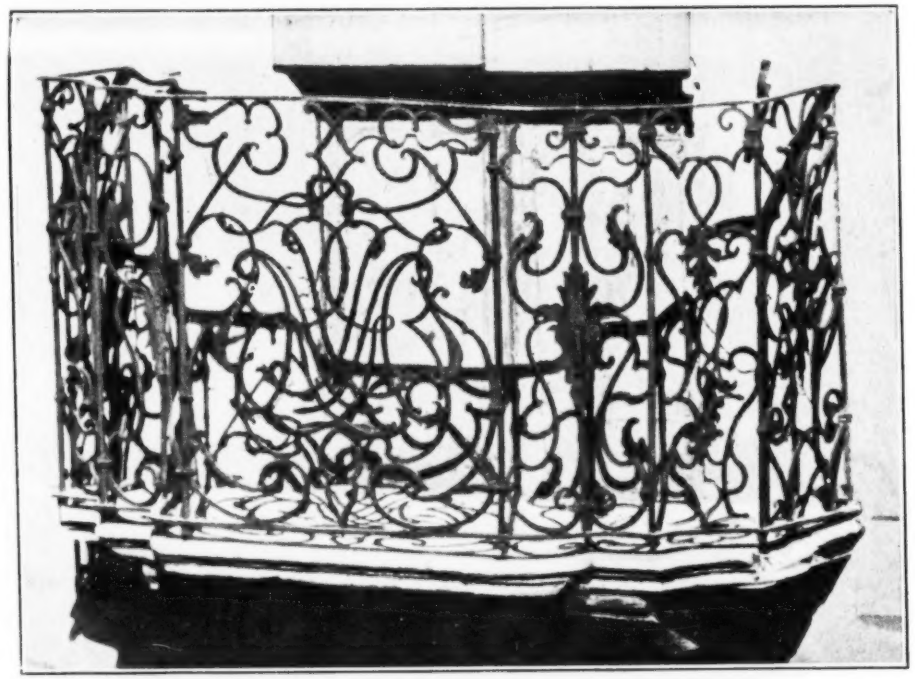


NORTH FACADE.

RUSSIAN ARCHITECTURE. CATHEDRAL OF ANNUNCIATION IN THE KREML', MOSCOW.—FROM DRAWINGS BY JEAN GODWIN.



PORTION OF MODEL OF OLD NEWCASTLE.—BY MR JOHN B. THORP.



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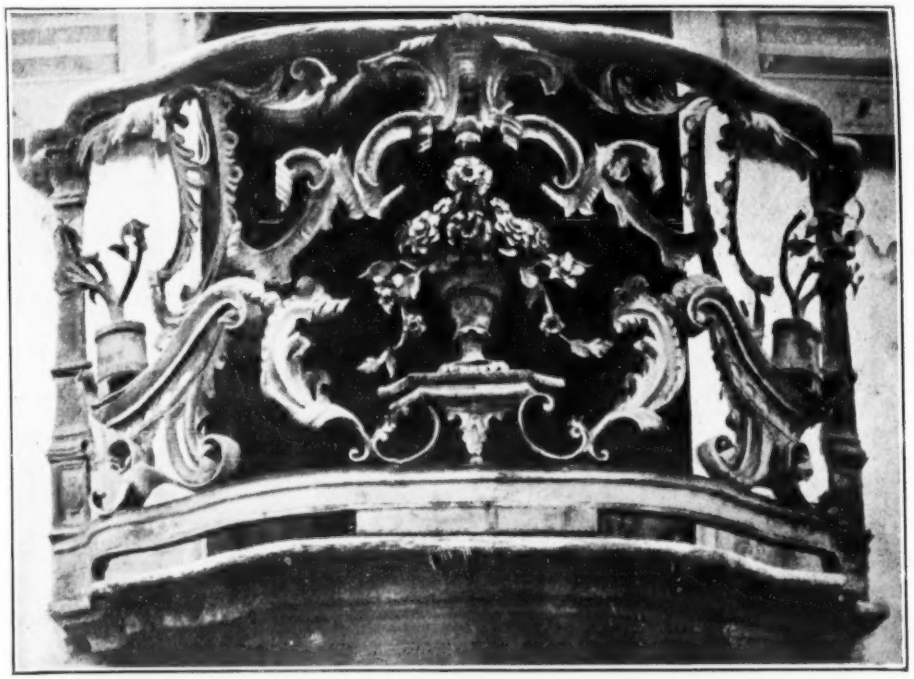

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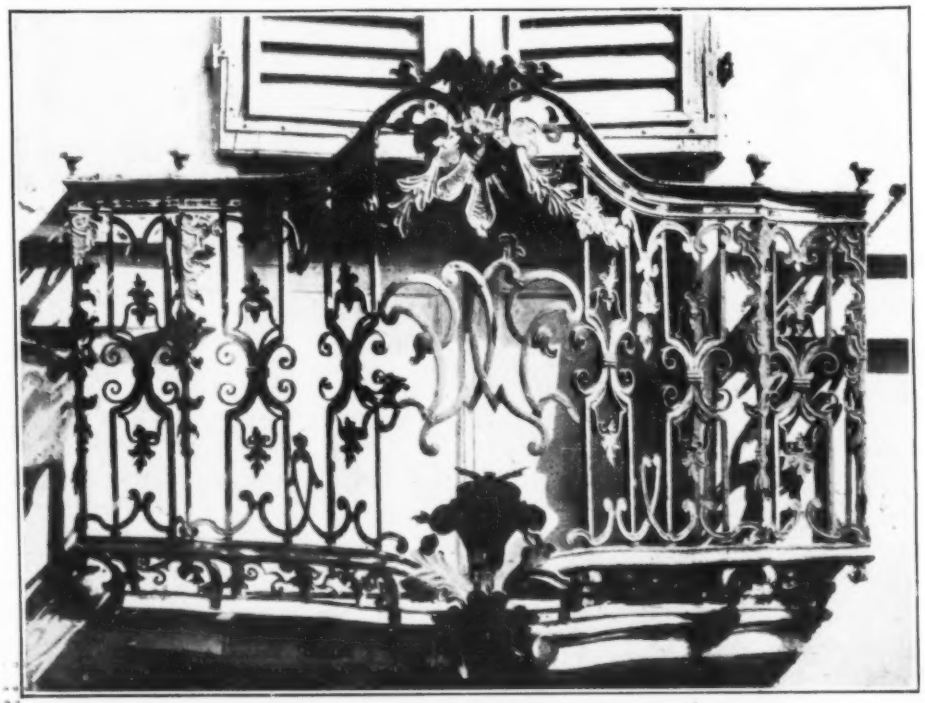

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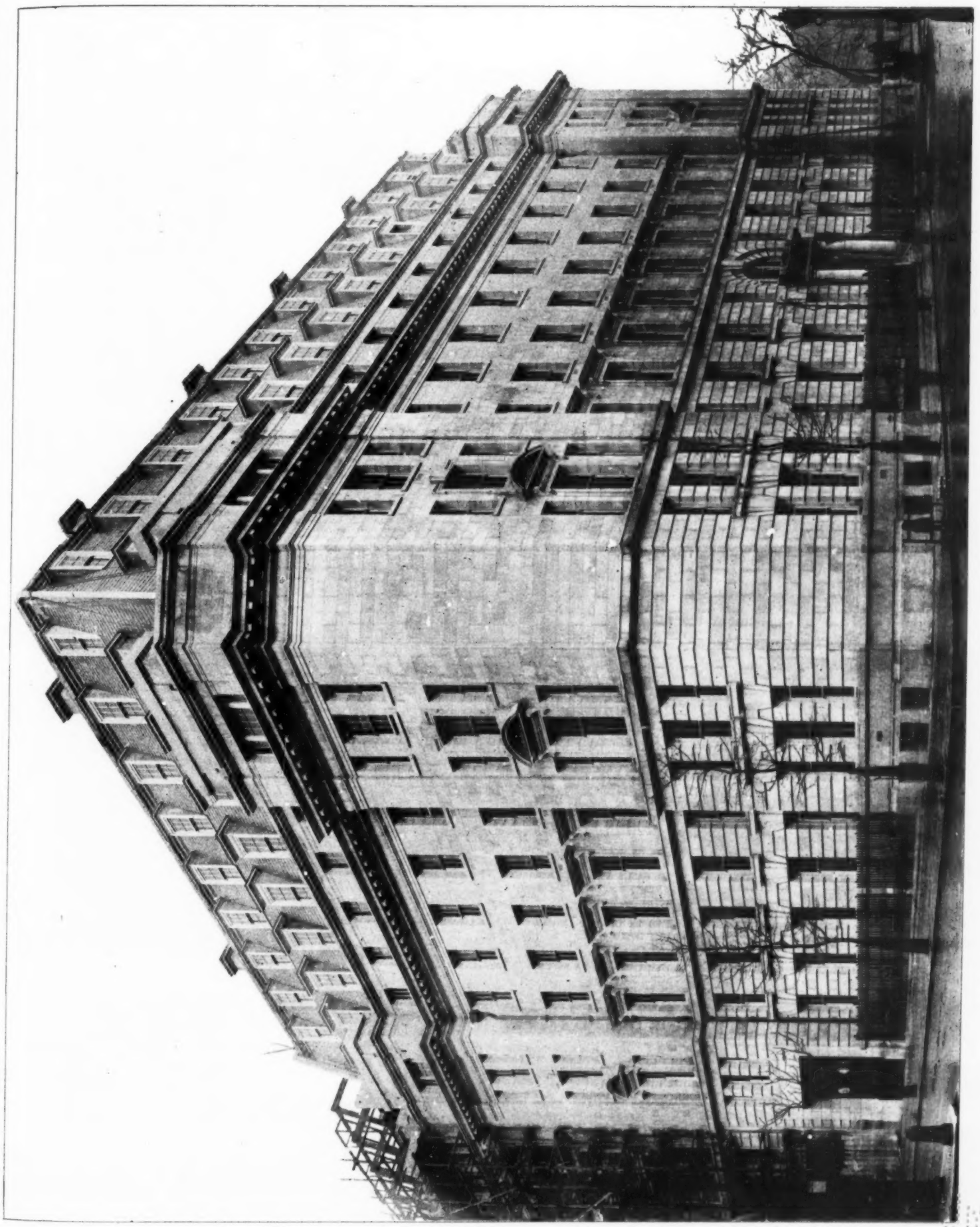

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THE LATE J. MACVICAR ANDERSON AND MR. H. L. ANDERSON, ARCHITECTS.

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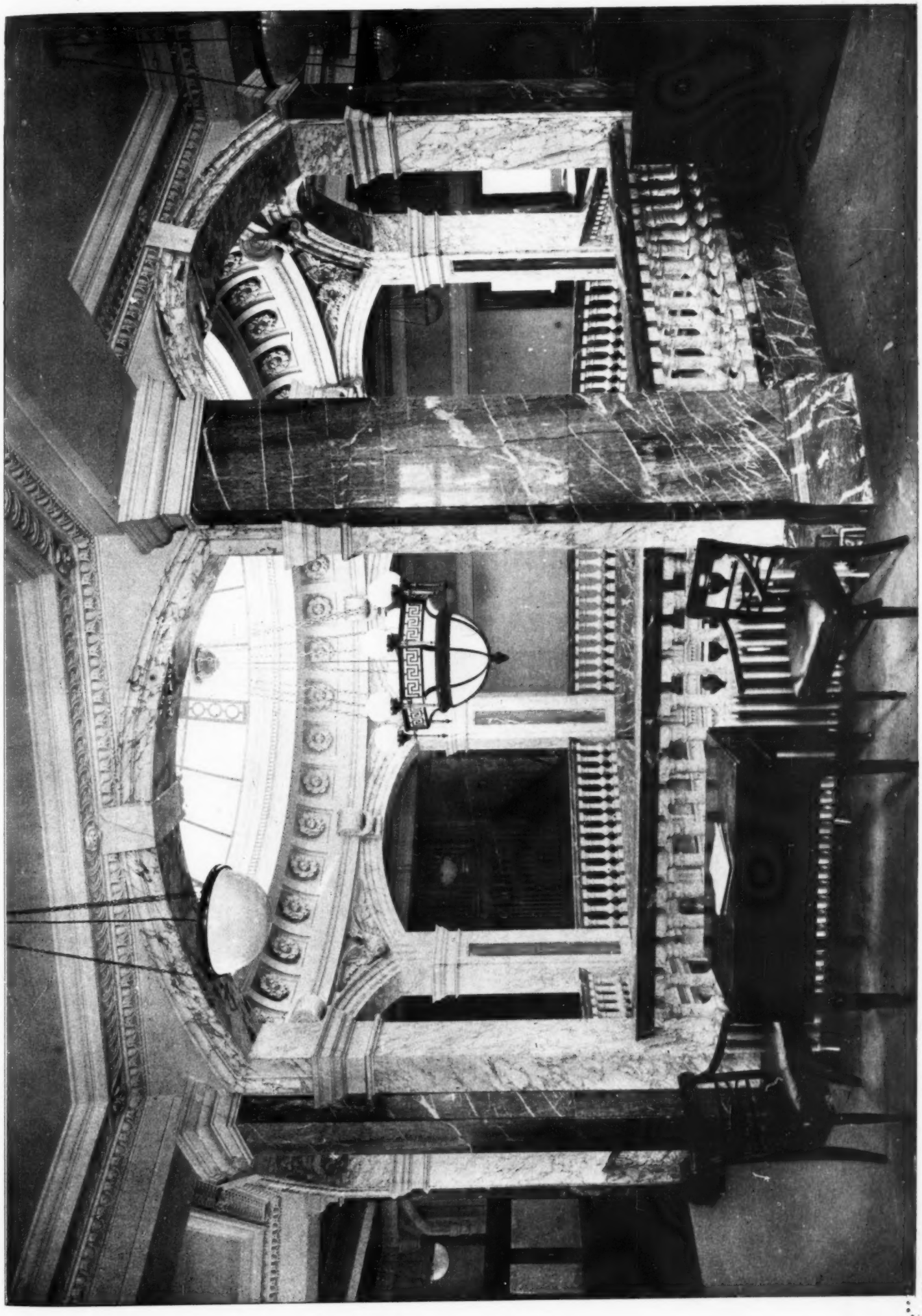

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THE LATE J. MACVICAR ANDERSON AND MR. H. L. ANDERSON, ARCHITECTS.

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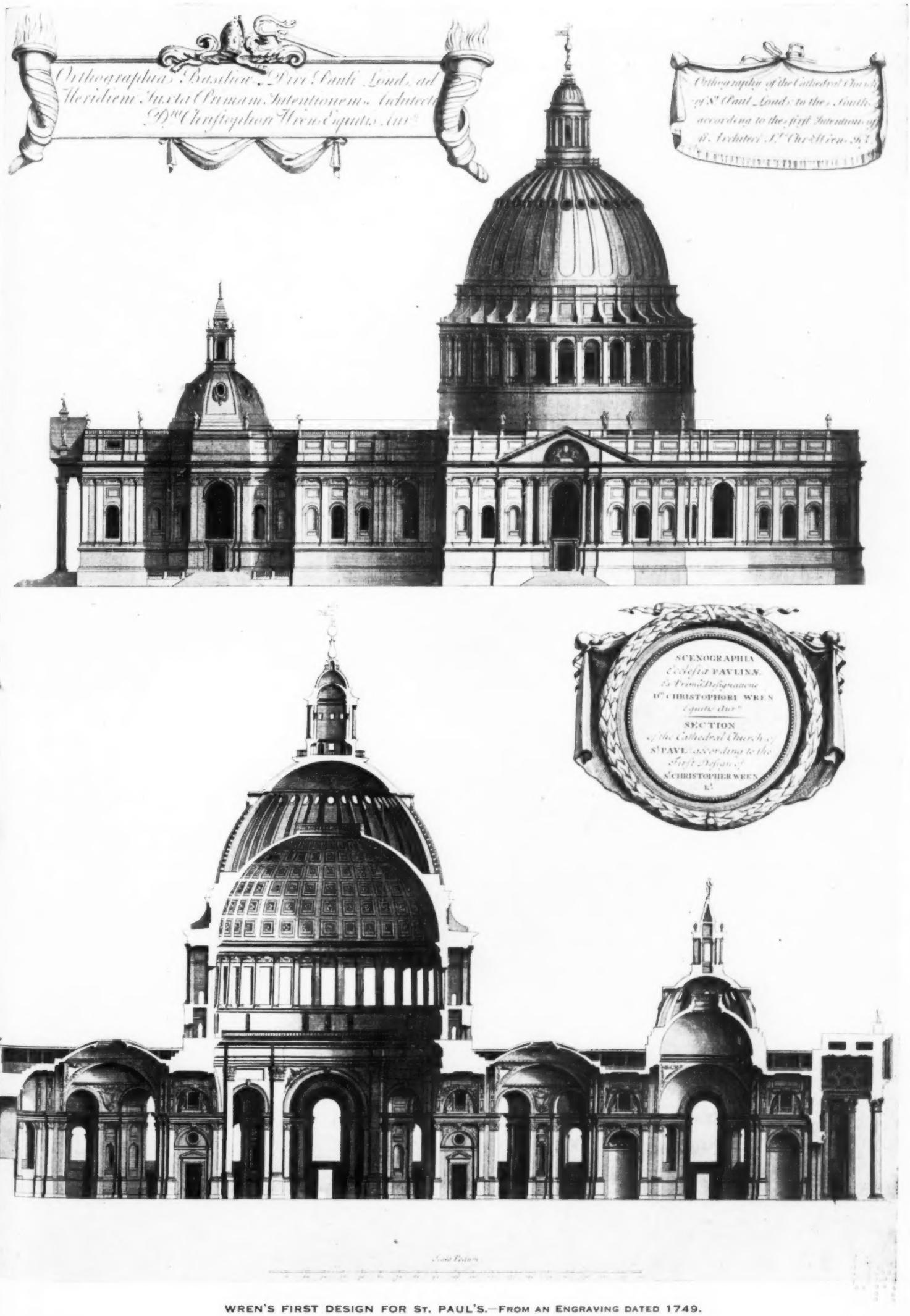
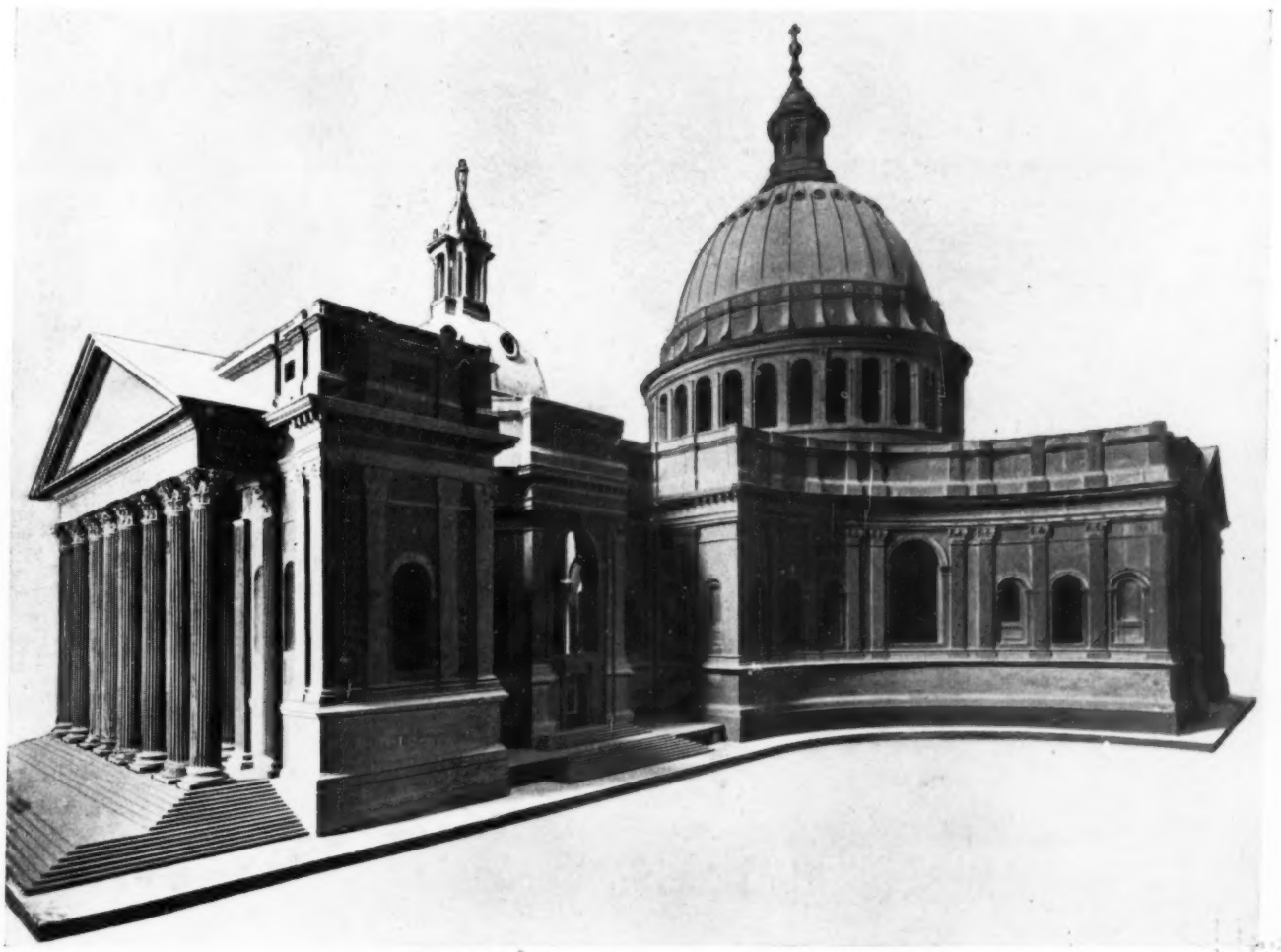


WREN'S FIRST DESIGN FOR ST. PAUL'S.—FROM AN ENGRAVING DATED 1749.



WREN'S MODEL FOR ST. PAUL'S (FIRST DESIGN).

(THE COLUMNS OF PORTICO ARE SHOWN RESTORED)

WREN'S FIRST DESIGN FOR ST. PAUL'S: INTERIOR VIEW, BY MR. J. E. GOODCHILD.

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